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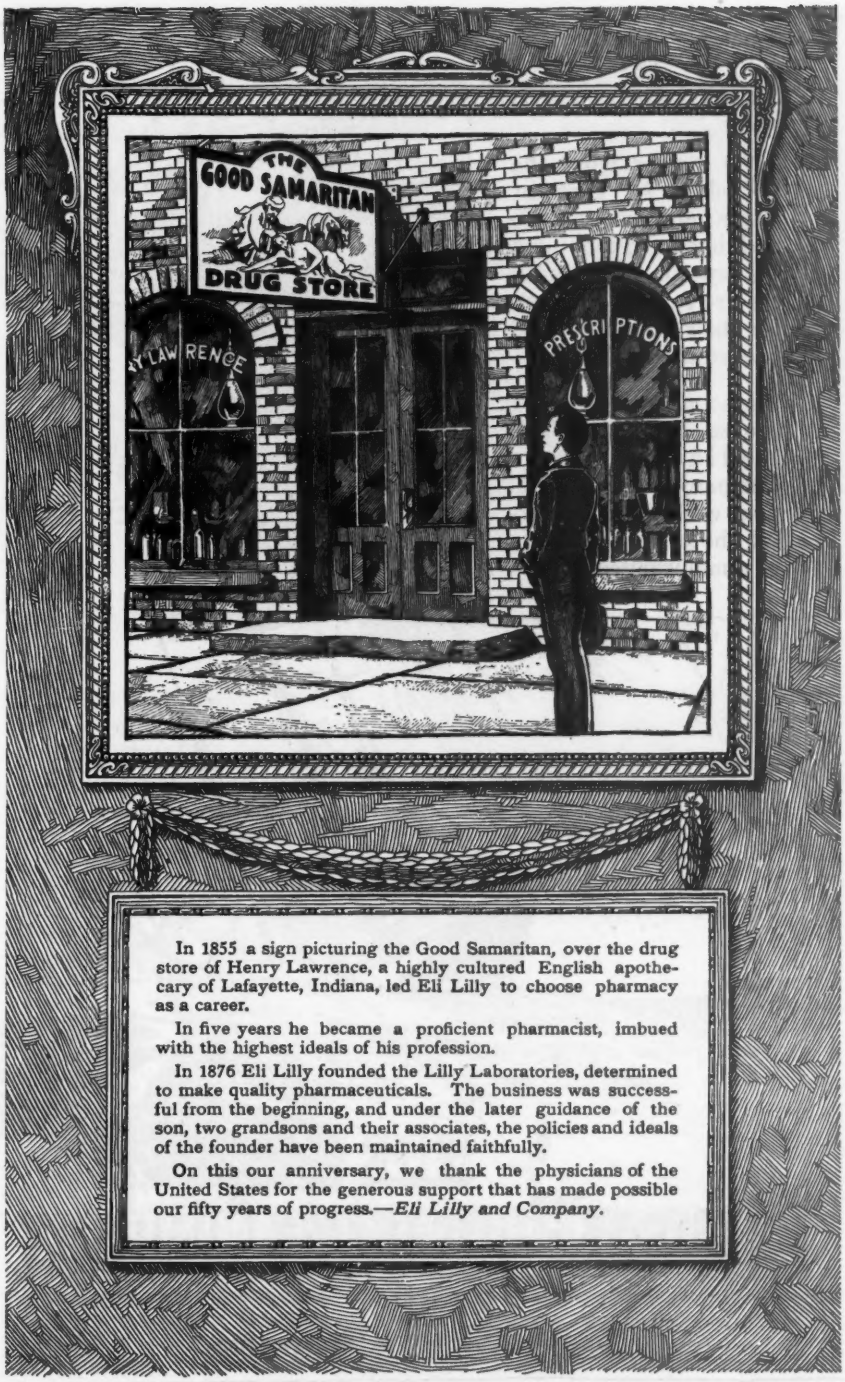

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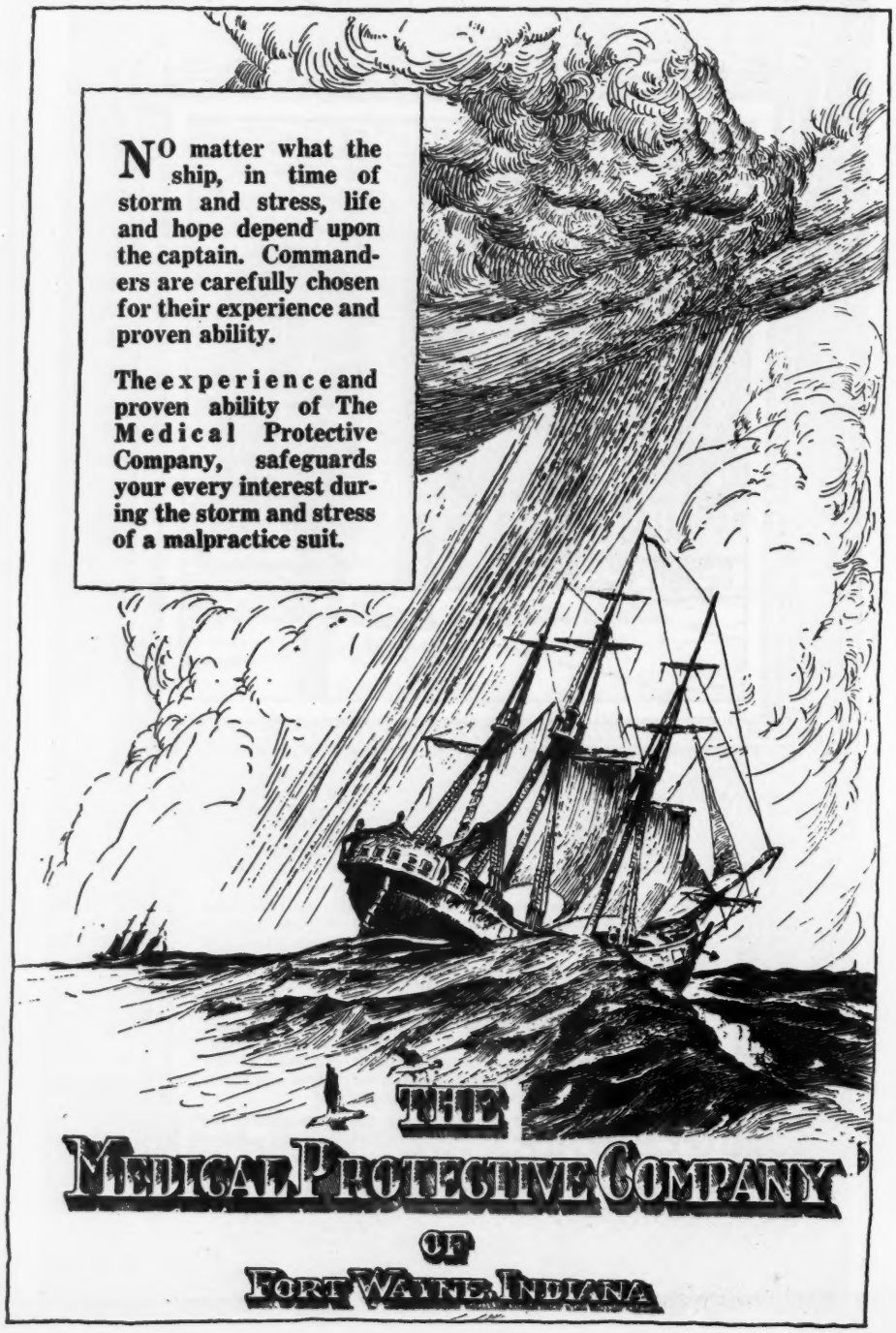
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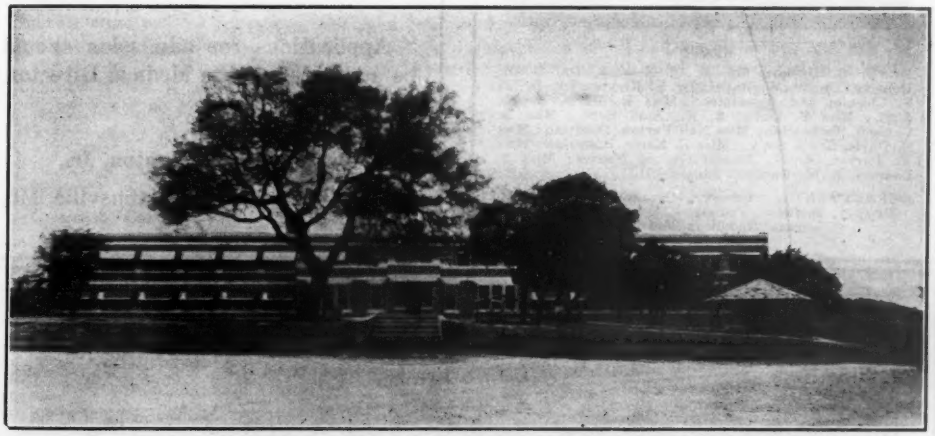

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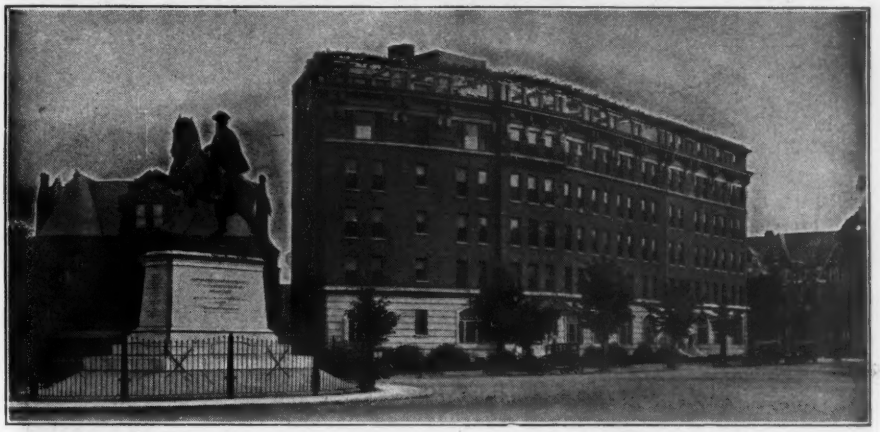

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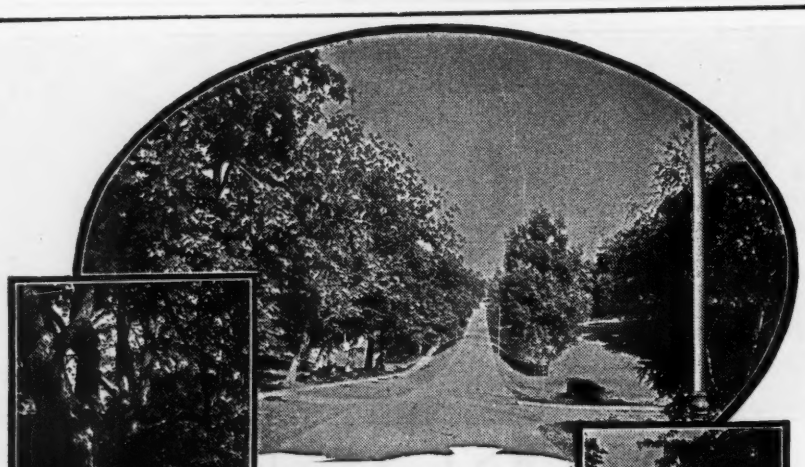

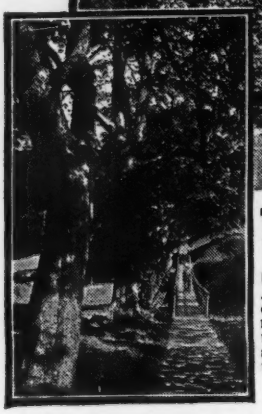

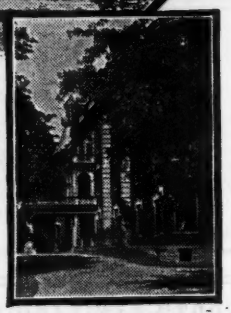

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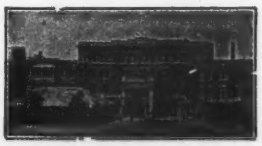

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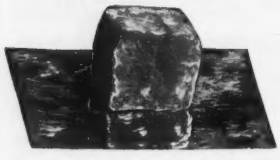

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MEDICINE

INTERNAL DISEASES, PEDIATRICS, NEUROLOGY, DIAGNOSTIC METHODS, ETC.

THE DIFFERENTIATION OF APLASTIC ANEMIA AND ESSENTIAL THROMBOCYTOPENIA: ITS IMPORTANCE FROM A THERAPEUTIC STANDPOINT*†

By J. B. McElroy, M.D., F.A.C.P., Memphis, Tenn.

One could scarcely expect to unroll the questions of aplastic anemia and Werlhof's disease in the time allotted for a paper here; but a short historical resume of our knowledge of these conditions will be advantageous to present the phase of the subject we have selected, the differentiation of aplastic anemia and essential thrombocytopenia: its importance from a therapeutic standpoint.

The term, aplastic anemia, originated with Ehrlich.[1] He had come to see the clinical expression of the red bone marrow discovered by Cohnheim[2] in pernicious anemia in the output of megaloblasts into the peripheral circulation. In 1888, he saw a very anemic woman with severe uterine hemorrhages. The red cells were about 215,000; there were no nucleated reds; the leucocytes were 2,000 and the lymphocytes 80 per cent. A severe anemia from loss of blood would be expected to show a polynucleosis. From these findings Ehrlich was of the view that the usual red marrow was absent. The autopsy showed a yellow marrow, thus confirming Ehrlich's view. He named the condition aplastic anemia. After that many similar cases were reported in the literature and these were collected and reviewed by Hirschfeld,[3] and Accolas[4] in 1911. Aplastic anemia came to be a well defined disease picture, characterized by oligocythemia, low hemoglobin per cent, absence of plastic changes in the red cells, leucopenia, a relative lymphocytosis and a marked tendency to the hemorrhagic diathesis.

Although Bettman,[5] with large doses of arsenic, Hirschfeld[6] with dead typhoid cultures, Blumenthal[7] and Morawitz with repeated bleeding of undernourished animals, and Selling[8] with benzol, were able to produce aplasia of the bone marrow experimentally, the symptoms in animals differed from those in human aplastic anemia in the absence of hemorrhages.

All clinicians agreed with Ehrlich as to the aplasia, but different views were held as to its mechanism. Some thought there was primarily an erythrotoxicosis with resulting exhaustion of the bone marrow, while others thought that there was a primary myelotoxicosis without previous extramedullary hemolysis. The first view, for a while, seemed to receive the weight of authority, as Turk,[9] Naegeli, Hirschfeld, Herz and Pappenheim accepted this view.

Many years ago, Denys[10] and Rivet, in studying a case of recurrent purpura, noted the marked diminution of the blood platelets in this case; and afterwards Hayem[11] called attention to the frequency with which diminished numbers of thrombocytes may be found in various hemorrhagic diatheses. Notwithstanding the excellent work of Duke,[12] these observations, did not, for a long time, obtain general recognition. In 1915, Frank,[13] in studying the hemorrhagic diathesis, also noted the diminution of the thrombocytes and the absence of changes of the coagu-

*From the Department of Medicine of the University of Tennessee.

†Read in Section on Medicine, Southern Medical Association, Nineteenth Annual Meeting, Dallas, Tex., Nov. 9-12, 1925.

Date	Erythrocytes	HB. Per Cent	Color Index	Anisocytosis	Poikilocytosis	Reticulated Cells	Nucleated Reds	Leucocytes	Polymorphonuclear	Small Lymphocytes	Large Mononuclear	Mast. Cells	Myelocytes	Stem Cells	Platelets	Eosinophiles	Bleeding Time	Coagulation	Bilirubin	Urobilin	Urobilinogen	Clot
3-15	3,050	45	.7			0	0	2,300	82	16	1				26000	1	45					Non retrac.
3-19	3,050	65	1.08					1,900	24	68	6				93000	2						
3-20	2,660	60	1.1					1,400	12	76	4	2	6		103000							
3-21	3,130	60	.9					1,600	18	72	6				116000	4						
3-22	2,866	55	.9					1,200	12	54	16		4	14	56000							
3-23	1,752	60	1.7					600	0	54	34			12	48000							
3-24	1,550	55	1.7					800	0	68	12			10	53000							
3-25	1,840	50	1.4					500	2	78	10			10	36000							
3-26	1,810	45	1.2					550							80000							
3-27	1,440	40	1.4					500							33000							

lation in these cases, thus differentiating them from true hemophilia, a point to which also Hayem had called attention. Knowing that aplastic anemia results from arsenic, x-rays and benzol, Frank thought that an endogenous toxin arising in the spleen, might give rise to a lack of blood platelets, also, resulting in a hemorrhagic diathesis, which he named essential thrombopenia. Since hemorrhages were common to this condition and aplastic anemia, he went further and tried to establish a close relationship between the diseases. In the former case, the action of the toxin was directed somewhat specifically against the thrombocytes; and in the latter case, aplastic anemia, its action was extended to the granulocytic elements and their forerunners, a condition to which he gave the name, hemorrhagic aleukia. Frank distinguished four types of essential thrombopenia: (1) an intermittent form; (2) a continuous form; (3) the continuous form might pass over into aplastic anemia; (4) the thrombocytes and granulocytic elements might be involved at the first and aplastic anemia develop at the onset. While Frank's views cannot be sustained *in toto*, to him, with others, is due the credit of placing the third corpuscular element of the blood in a prominent position in the clinic of the hemorrhagic diathesis. In recent times, only Klinger,[14] of Sahli's clinic, has opposed this view and explains the tendency to hemorrhage and thrombocytopenia as at most, parallel manifestations which stand in no direct connection with each other.

In 1919, Kaz Nelson[15] summarized the histological, experimental and clinical evidence which supported the views of Hayem, Duke and Frank. A marked diminution of the platelets may be regarded as an important factor in a great number of the essential and symptomatic forms of hemorrhagic diathesis, which occur clinically as purpura hemorrhagica. Here belong the general hemorrhages in numerous infections, such as typhoid, tuberculosis, sepsis, diphtheria, variola, Weil's disease, Hodgkin's disease; the hemorrhages in many intoxications, such as benzol, arsenic and x-rays; the hemorrhages in some cirrhoses and splenomegalies; the hemorrhages in many blood diseases, as aplastic anemia, leukemia, aleukemic lymphadenoses, pernicious anemia; and the hemorrhages in Werlhof's disease. From these various diseases, Kaz Nelson brings a grouping according to the mode of origin of the thrombocytopenia. In the one case there is an injury to the mother cells in the bone marrow with deficient regenerative power; in the other there is an extramedullary destruction of the thrombocytes in the reticulo-endothelial system. This classification, he bases on histological evidence. In the first there is an absence of megacaryocytes in the bone marrow and no evidence of thrombocytes or myeloid elements in the spleen; while in the second, the megacaryocytes are present in great numbers in the bone marrow and there is marked thrombocytophagia in the reticulo-endothelial system, especially of the spleen. These observations were confirmed by Eppinger,[16] Gorke,[17] from Minkowski's Clinic and Sternberg,[18] from Koranyi's Clinic, and others who have studied these cases histologically. So that in the present state of our knowledge, I think that aplastic anemia may be regarded as a primary myelotoxicosis with deficient regenerative power of the bone marrow elements, while essential thrombocytopenia may be regarded as a thrombocytolytic purpura with secondary anemia.

Supporting this view, I wish to report the following cases, the first one aplastic anemia, the second essential thrombocytopenia.

C. Y., a white youth of 17, a student with negative past and family history, consulted us on March

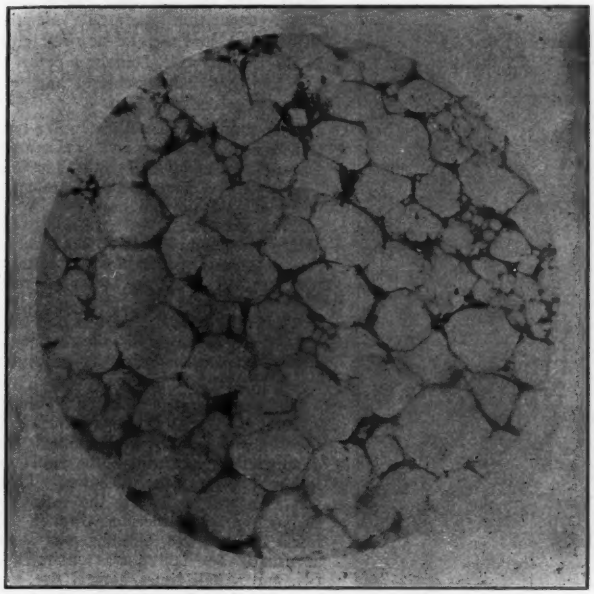

Fig. 1. S-5278. Bone Marrow. Fatty, aplastic. x500.

3, 1924, complaining of bleeding from the nose and gums. About one week before this he noticed some blood on his pillow. On the following morning his nose bled profusely for two and a half hours. Epistaxis would recur when he assumed a stooped position. His gums began to bleed rather profusely and have continued. Soon after the onset of the hemorrhages he noticed numerous petechiae over the body. He also passed blood with the urine and from the bowels.

He was a well developed youth of extreme pallor; temperature 101.4°, pulse 112, and blood pressure 135/85. Blood exuded from nose and gums and there was numerous petechiae and echymoses over the body and extremities. The tonsils were enlarged; heart and lungs were normal, and there was no adenopathy. The spleen could not be palpated. Leed's phenomenon was positive. The urine contained albumin, and red cells, but no casts. Blood examination showed: hemoglobin forty-five per cent; red cells, 3,050,000; whites, 2,300; polymorphonuclears 82 per cent; small lymphocytes, 16 per cent; large lymphocytes, 1; acidophils, 1; no nucleated or reticulated reds; no polychromasia; bleeding time 45 minutes, with a non-retractile clot, and negative blood culture.

This chart shows the temperature curve. The following table shows the blood picture, followed daily:

The hemorrhages, with slight remissions, continued. Pain in his joints and an angina necrotans developed, and the patient died on March 27, twelve days after his first visit to us.

At autopsy there were generalized subserous hemorrhages, the spleen was not enlarged and the bone marrow of the end of the femur and ribs was fatty. This section shows the marked aplasia of the bone marrow.

This is one taken from the spleen, in which there is hyalin degeneration of the splenic vessels, absence of germ centers in the Malpighian corpuscles, and no evidence of megacaryocytes, platelets, or myeloid metaplasia.

The next case, Wm. M., was admitted to the Memphis General Hospital on December 23, 1923, complaining of hemorrhage from the nose and blood spots over the body. His family history was negative. He was said to have had malaria two months before admission. There has been a tendency for his gums to bleed all his life. Five days before admission, there was severe bleeding from the nose and gums. About two days later he noticed hemorrhagic spots over his body.

He was a pale boy of about 14 years. There was a tampon in the left nostril. Blood oozed from nose and gums. Teeth and pharynx were bloodstained; mucous membranes pale; heart and lungs normal; the spleen was four fingers below the left costal margin; and there were purpuric spots over the whole body and lower extremities. Temperature was 99°, pulse 100, respiration 22, urine negative except for the presence of a few red blood cells. Blood examination showed hemoglobin 29 per cent, red blood cells, 2,288,000; white blood cells, 6,500; polymorphonuclears, 60 per cent; small lymphocytes, 40 per cent; slight anisocytosis, marked polychromatophilia; no nucleated reds; bleeding time, 30 minutes; and a non-retractile clot.

Under rest, diet, calcium lactate and hemostatic serum, the condition grew progressively worse. On January 3, 1924, the hemoglobin was 20 per cent, red blood cells 1,160,000, white blood cells, 6,000; polymorphonuclears 62 per cent, small lymphocytes 37 per cent; basophils, 1; platelets, 90,000; bleeding time 30 minutes and the clot non-retractile. In the fragility test, hemolysis began at 0.4 and was complete at 0.32. He was transfused with 500 c.c. of blood, after which he improved markedly. On January 11, 1924 his hemoglobin was 44 per cent, red blood cells 3,200,000; whites, 8,000, and platelets 218,000, though the bleeding time was still prolonged and the clot non-retractile. On January 26, his spleen was removed by Dr. R. L. Saunders. There was an irregular temperature for several days. Two weeks later the hemoglobin was 58 per cent, red blood cells 4,170,000, bleeding time normal, and clot retractile. About this time he had a hard chill, and tertian malarial parasites were found in his blood. The temperature subsided under quinin and the patient was discharged in good condition. The Social Service of the hospital reports the boy in good condition, having no hemorrhages and working.

Here is a section of his spleen, in which you may very distinctly see megacaryocytes and there is also quite marked evidence of myeloid metaplasia. It may be suggested that this is a case of symptomatic purpura hemorrhagica.

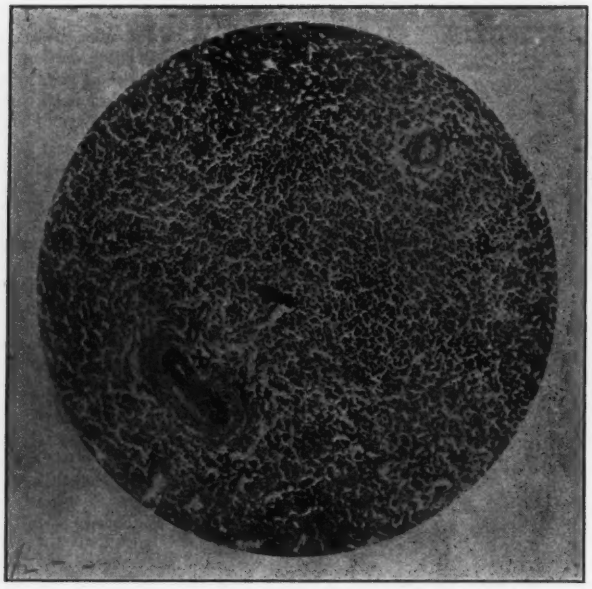

Fig II. Spleen (S-5368) (a and a') Two Malpighian corpuscles composed entirely of lymphocytes, no lymphoblasts present. (b and b') Central artery of each Malpighian corpuscle partly hyalinized. x130.

The next case may be reported as one of true essential thrombocytopenia and illustrates the difficulties the surgeon may encounter in these cases.

Mrs. C. D., aged 35, had had purpura at intervals for 15 years, and bleeding from mucous membranes for ten months. Her father bled easily and freely from trivial injuries. She had always bled easily and bleeding was hard to stop. She was the mother of two children, and had almost bled to death with each delivery. Pregnancy about one year previously was terminated by her physician because of this tendency to bleed. Dilatation and curettage resulted in a nearly fatal hemorrhage. Purpuric spots followed this and also hemorrhages from the nose and mucous membranes. She had had great loss of blood from the rectum for the preceding month with bowel movements and at times with the urine. She had dyspnea on exertion. She had attacks of epigastric pain, and no jaundice.

She was a well nourished lady, weight 158, height 5 feet 2 inches, temperature 98, pulse 90, blood pressure 128/80, and a systolic murmur at the apex of the heart. The liver was palpable two finger-breadths below the costal margin, the spleen two fingers below the costal margin. There were purpuric spots on the arms and legs, the size of a quarter, smaller than usual. Hemorrhoids were present, and an old perineal laceration. The urine was negative. Blood examination showed: hemoglobin, 35 per cent; total reds, 2,820,000; color index 0.6; platelets, 90,000, anisocytosis and poikilocytosis, achromia and polychromatophilia. The bleeding time was 16 minutes, coagulation time 10 minutes (Morawitz), and the clot non-retractile. In the fragility test, hemolysis began at 0.38 per cent sodium chlorid and was complete at 0.30 per cent.

Splenectomy was advised. She was transfused, her husband being the donor. His blood was said to match. The patient came near dying from the reaction. Within the next two weeks she was transfused twice without accident. On January 28, two days before the proposed operation, the platelets were 86,000; bleeding time, 6½ minutes; hemoglobin, 57 per cent; red blood cells, 3,000,000; white blood cells, 5,800, with 53 per cent polymorphonuclears, 41 per cent small lymphocytes, and 6 per cent large mononuclears.

She was operated upon on February 7, 1925, by Dr. McGhee, at which time the following notes were made: Abdominal incision through the skin was followed by profuse bleeding. There was a general ooze from the entire cut surface. In the incision through the fascia and muscles, bleeding was about as usual. The spleen was enlarged to two and a half times normal size, and was densely adherent along the entire posterior border from the diaphragm to the lineo-renal ligament. The hilus surface of the spleen was adherent to the pancreas, the gastro-splenic omentum through the surface. The gentlest pressure on the great omentum was followed by hematomata. Splenectomy under the above conditions was considered impossible. No attempt was made to deliver the spleen.

The differential features between aplastic anemia and essential thrombocytopenia may be tabulated as follows, modified somewhat from Gorke's tabulation:

We think it is extremely important to make this differentiation, especially since splenectomy has come so much into vogue in the treatment of hemorrhagic diathesis. All of the cases of aplastic anemia which have been splenectomized have died, usually shortly after the operation. Eppinger reports one, Gorke one, Mushan two, and possibly others have been reported as acute purpura hemorrhagica. Therefore, splenectomy would here seem to be positively contraindicated, while, as you know from the rapidly accumulating literature, splenectomy is of decided benefit and at times curative in essential thrombocytopenia.

CONCLUSIONS

Aplastic anemia is a severe myelopathy with deficient regeneration of the blood elements, characterized in many cases by extreme pallor

of the skin, hemorrhages from the mucous membranes, petechiae and ecchymoses, absence of splenic enlargement, diminished hemoglobin metabolism, absence of plastic changes in the red blood cells, leukopenia and relative lymphocytosis, pronounced thrombocytopenia with lack of reaction from adrenalin and splenectomy, Rumpel-Leed's phenomenon, prolonged bleeding time, non-retractility of clot, reduced bilirubinemia and aplastic bone marrow, which resists all forms of treatment and in which splenectomy is positively contra-indicated.

Essential thrombocytopenia is a thrombolytic purpura, differing from the above in periodical occurrences of hemorrhages from the mucous membranes, frequently enlarged spleen, normal hemoglobin metabolism, presence of plastic changes in the red blood cells, increase of blood platelets after adrenalin and splenectomy,

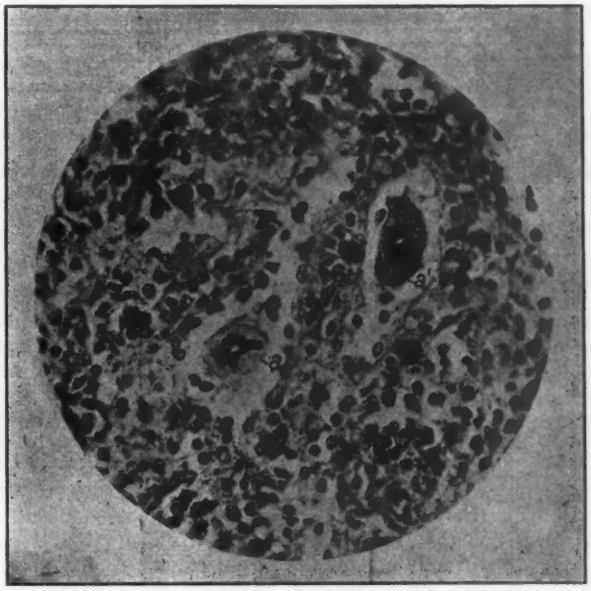

Fig. III. Spleen -a and a' Megacaryocytes. x260.*

	Aplastic Anemia	Essential Thrombocytopenia
I. General Symptoms—		
(a) Color of Skin	alabaster white	variable
(b) Skin and Mucous Membrane Hemorrhages	usually pronounced	periodical occurrence with free intervals
(c) Mouth Cavity	frequently gingivitis, stomatis, angina necrotans,	numerous small hemorrhages almost always gingivitis
(d) Spleen	often small, not palpable	enlargement may be present
(e) Urine	no urobilinuria	often urobilinogen
(f) Gastric Secretion	often disturbed	usually normal
(g) Stool	very slight urobilin content	normal urobilin content
II. Blood Findings—		
(1) Morphology		
(a) Erythrocytes	oligocythemia, progressive; poikilocytosis, polychromasia; reticulated cells absent	number variable, often evidence of regeneration
(b)) Leucocytes	leukopenia, marked reduction of granulocytes, relative lymphocytosis	often leucocytosis differential count shows nothing distinctive
(c) Blood Platelets	pronounced thrombopenia, (adrenalin and splenectomy do not produce an increase of thrombocytes)	during attack marked thrombopenia; after adrenalin and splenectomy an increase of platelets
(2) Stasis Experiment	skin hemorrhages	skin hemorrhages'
(3) Bleeding Time	markedly prolonged	prolonged during attack
(4) Retractility of Clot	absent	absent
(5) Color Index	usually one	below one
(6)Bilirubin Content	reduced	normal

and a variegated bone marrow which is often benefited and frequently cured by splenectomy.

*I am indebted for the pathological report of these cases to Dr. Harry C. Schmeisser and for the illustrations to Mr. Joseph L. Scianni, director and illustrator, respectively, of the Pathological Institute, University of Tennessee, College of Medicine.

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BRONCHIAL ASTHMA IN CHILDREN*

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Many investigators have for some time been convinced that hay fever, asthma and urticaria are manifestations of foreign proteins introduced into the body with a resulting specific proteolytic ferment (Kuhn's). The relationship of these manifestations seems close, although it is very difficult to explain. It is a common observation that we find in an asthmatic a previous history of infantile eczema or repeated attacks of urticaria.[1] Chandler Walker makes the suggestion that the foreign protein irritating the upper respiratory tract of sensitized animals stimulates the constrictor fibers of the vagus, producing a stenosis of the smaller bronchioles by spasm of the circular muscle, and food proteins may act in a similar manner after absorption.

Kuhn says that even infants suffer from asthma, a condition often overlooked by the clinician. Recurrent attacks of bronchitis with sibilant rales which clear up promptly with the use of adrenalin, must be considered as possibly the beginning of true asthma, which is more often manifested in later life.

Bronchial asthma is manifested by the sudden onset of paroxysmal dyspnea, hyperdistension of the chest, hyper-resonance, fixed chest walls with sibilant rales and prolonged inspiration and expiration. Porter and Carter state that while the present view is that many cases of asthma seen in children are an expression of anaphylaxis, yèt the number of instances in which the sensitizing protein is discoverable is not great. This is not in accord with Cooke and van der Veer, Walker, Bernton and many other men working in the field of allergy. Neither will our own findings support those of Porter and Carter.

The best clinical classification of asthma is the following:

Sensitive Type

(1) Inspiratory, due to pollens as in hay fever, animal emanations, dust.

(2) Ingested type, due to meat, eggs, milk, cereals, etc.

(3) The non-specific or bacterial type, due to chronic bronchitis, asthma following repeated inspiratory infections, as bronchial pneumonia, influenza, measles, etc.

It is our intention in this paper to present some conclusions as suggested by the data afforded in our own cases. We feel the results obtained have with each year become more gratifying, due to greater accuracy in determining the offending protein, and to a more comprehensive management. The best results can be obtained only by skillful sensitization tests and also by skillful desensitization of the patients. I wish here to outline carefully the technic followed by Dr. Ray M. Balyeat, who has furnished me much time and patience, and some case reports from his own records.

SKIN TESTS

In children we use only the dermal test. We believe that on account of the sensitivity of the skin in children intra-cutaneous tests are seldom necessary. It is true that many times we will find a child whose skin does not show positive reaction on first testing, especially if the time is just following an attack of some form of allergy, such as asthma, hay fever, or eczema, but if this same child is tested several days after the attack, or just previous to the attack, the skin shows the reaction to the sensitive protein. Repeated tests are at times, necessary. In any case with a family history of allergy in which negative results are obtained in skin testing, the tests should be repeated. Many cases will prove positive that previously were negative. Then, too, it is of great importance to retest in all cases which have been under treatment and which cease to respond to treatment, as children frequently become sensitive to other proteins.

No bacterial proteins have been used in testing, as it has been shown by several investigators that bacterial allergy plays a very small part in the cause of asthma.

We believe that a reaction should not be counted positive unless it be characterized by a wheal with offshoots or pseudopods.

Positive Skin Tests.—Analyses of our cases reveal the following: 60.2 per cent reacted to the protein of animal emanations. Of this group 48 per cent reacted to feathers. Those sen-

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sitive to cat hair, rabbit hair, horse hair, dog hair, etc., make up the remainder of the group. Clinical experience has also taught that feathers are a very important factor, and a great deal of attention should be paid to them in management. Wheat and eggs were positive in 20 and 18 per cent of the cases, respectively. Vegetables gave reactions in 14 per cent of the cases. Clinically it is believed that vegetables and fruits play practically no part in the cause of asthma. They are usually found positive along with some high protein foods such as eggs, wheat and milk. Our cases, compared with those of other investigators, show a strikingly large percentage who are sensitive to pollens, 56 per cent. Most of these were due either to grasses, water hemp or ragweeds, bermuda being the most common grass. Ten per cent were sensitive to orris root. The majority of the cases showed a multiple sensitivity, which certainly must be taken into consideration in management.

Age.—None of our cases were over 12 years of age. In 44 per cent asthma began before the end of the third year, and in 8 per cent of all cases asthma began before the end of the seventh year. More than 50 per cent of these did not have typical cases of asthma as seen in adults. Their attacks first began with frequent head colds and bronchitis, with or without fever. Many began as typical sneezers, or children with wet noses. Asthma, atypical, as we often see it in children, is many times taken for pneumonia or bronchitis. Failing to recognize it and remove the cause, or desensitize the patient to the sensitive protein, endangers the child because of the liability to repeated secondary paranasal infections, or to pneumonia.

HEREDITY

There was a history of allergy on both sides of the family in 16.4 per cent, and in 48.4 per cent a unilateral history of some form of allergy. This makes a total of 64.8 per cent with a family history of allergy. This fact, in our judgment, is of considerable importance.

By determining the specific cause early in life and instituting proper management, many patients may be protected from asthma later in life and from markedly deformed chests and bronchial tubes so dilated that they are not able to carry on the ordinary activities of adult life. It is very common to see a child of fourteen or fifteen whose chest is markedly deformed and who is practically an invalid at that age.

Following are two cases of pollen sensitization:

Case I.—A female, age 5, had a peculiar nasal cold at six months of age. In the middle of September at the time of the first cold spell and rain, she developed an attack of respiratory dyspnea. These attacks continued rather frequently afterward, except during May, June, July and August. Protein tests showed marked sensitivity to duck feathers, wheat, giant and short ragweeds.

Case II.—A male, age 12, had developed constant nasal colds in May when eight weeks of age, which continued throughout the summer. In the early fall he developed typical attacks of asthma. These continued winter and summer at intervals until he was ten years of age. There was a history of bilateral allergy in the family. Protein tests showed sensitivity to some of the spring grasses. Treatment by desensitization early each spring, has given complete relief from his nasal colds and asthma.

The frequency of pollens as a factor in the production of asthma in children, has not been given the prominence that it deserves. Of course, we realize that it is not so important a factor in children as it is in the asthmatic adult. Records from a large series of hay fever patients show that the average onset of symptoms was 22.5 years. Children who are sensitive to pollens usually do not have typical hay fever before they are 10 years of age, just as frequently they do not have typical asthmatic attacks. Their hay fever is in the form of wet noses, and their asthmatic attacks are in the form of repeated attacks of bronchitis. It has been estimated, by Walker and others that in adults 66 per cent of hay fever patients become asthmatics, and it seems that this is true of children. That a child has his asthmatic attacks only in winter is no reason why the chief factor in the cause of his asthma is not pollen irritation in the summer. The irritation of bronchi produced by pollens in the summer and early fall will not in itself bring on attacks of bronchiospasm, but the irritation of the bronchial tree, plus the cold air of the fall, plus an associated infection of the bronchial tubes, will produce attacks of asthma. If the original cause were controlled by desensitization and the patient allowed to enter the fall with a normal mucous membrane, the attacks would probably not occur.

ANIMAL EXAMINATIONS

Case I.—A male, aged 5, began having typical attacks at 3 years. There was a unilateral history of allergy in the family. The attacks began first in the summer and continued during both winter and summer. There was a history of nasal colds. For acute attacks, adrenalin hydrochlorid 1:1000 gave immediate relief. Skin tests showed sensitivity to dog hair. From the history obtained it was found that a dog

fancier lived next door, so that the child constantly breathed dander from the kennels. Desensitization with dog hair has given relief for the past three years. Repeated doses of high dilution at monthly intervals, however, have been used.

Case II.—A male, age 5 years, had his first attack of asthma at 4 years of age. There was a history of nasal colds. Peculiar attacks of croup first developed and then attacks of bronchitis, at first without fever, but later with 2 to 3 degrees. The diagnosis of bronchial pneumonia was made several times. Upon inquiry a history was given that at the time these attacks of bronchial pneumonia, so-called, first developed, several Belgian hares were given to the patient as pets. Protein tests showed sensitivity to rabbit hair, goose and duck feathers. The parents were advised to dispose of the rabbits and relief from attacks of so-called bronchitis was obtained in a very short time. They were advised to discard all feather pillows, as is our custom whether a child is found sensitive to feathers or not. This child was sensitive to feathers and we felt that it was quite necessary, but we learned later that the second request was not obeyed, as the child's trouble soon cleared up.

It is quite evident that although a child may be sensitive to several feathers, animal hair, and probably some foods, some one of these is the chief offender. Treatment of cases caused by dog or horse hair by protein desensitization is very satisfactory. Most of the other pets can be discarded so that desensitization is not necessary.

APPARENT BACTERIAL TYPES WITH PROTEIN BACKGROUND

Case I.—A female, age 11, had a history of frequent attacks of sneezing and chronic bronchitis since she was 3 years of age. There was a bilateral history of allergy in the family. The diagnosis of bronchial pneumonia in early life was repeatedly made, which resulted in a chronic bronchitis, according to the statement of the patient. There was a large amount of purulent sputum with each attack, and also considerable fever. Physical examination showed inspiratory and expiratory dyspnea, from which immediate temporary relief was obtained by the use of adrenalin hydrochlorid, which led us to believe that this patient belonged to the sensitive type. Along with the history of allergy in the family was sufficient evidence to demand thorough protein tests. Protein tests showed orris root sensitivity, and desensitization with it gave complete relief.

In all cases of bronchitis and nasal irritation, the cause of which is not very plain, one is justified in suspecting a protein background.

TRUE BACTERIAL TYPES

Case I.—A female, age 12, began having attacks of bronchitis at four years of age, following whooping cough and measles. There was no history of allergy in the family. For several years the attacks were only in the winter. During the preceding few years the attacks have been winter and summer. The attacks were chiefly inspiratory and were relieved but slightly by adrenalin. They were always associated with some fever, for the preceding three years with a large amount of sputum. The child was always short of breath. Physical examination revealed a typical bronchitis and the x-ray showed some dilation of the bronchial tubes. Protein tests were done on this patient, to be sure that some protein was not playing a part. From the history one naturally felt that protein was not a factor.

Case II.—A male, age 11, developed some wheezing just following an attack of influenza in 1920. The influenza was very depleting and the patient seemed septic for several weeks. There was no history of allergy in the family. The onset following a depleting disease would lead one to think of the purely bacterial asthma frequently seen in adults. Protein tests were all negative.

Histories like the two above are not at all uncommon. A depleting disease like measles and whooping cough or influenza not only reduces the resistance of the individual to a marked extent, but begins as a respiratory infection, and leaves chronic infection difficult to overcome. The majority of cases give nothing in the history that would lead one to suspect a protein background.

TREATMENT

General Management.—For the acute attack which is usually sudden in its onset, nothing gives such immediate, if only temporary relief, as the use of atropin and adrenalin chlorid, administered hypodermically. I believe it is unwise and unnecessary to give morphin in infants and children for this condition. Such sedatives and antispasmodics as sodium bromid and antipyrin are very useful in the management until such time as a thorough investigation for a specific cause may be made. History of heredity, laboratory reports, protein tests, together with a very complete physical examination, especially of the nose, paranasal sinuses, throat and chest are imperative. All asthmatic children should be protected against respiratory infections, either from exposure or from contact with one already infected. The removal of adenoids and tonsils and treatment of paranasal infections should be insisted upon if necessary, not that by so doing we will cure the asthma, but for the benefit to the general condition of the child. It is well to explain this clearly to the parents. It has repeatedly been noticed in asthmatics that an attack is brought on by the inhalation of cold air, therefore, warm, moist air at the temperature of 65 to 70° should be advised. The importance of pure air, light, sunshine and favorable surroundings and habits should not be forgotten. The use of ultra-violet rays is strongly advised by many.

Pollen Cases.—Our experience in the past has led us to believe that pollen in the Western

States plays a much more important part in the cause of asthma than has been believed. Pollen cases should be tested each year, and great care should be used in selecting the pollen for desensitizing. The treatment should be given in much larger doses than is ordinarily used. In the treatment of asthma due to pollens in children, pollen therapy is about as specific as quinin is for malaria, provided the correct pollen or pollens are selected, potent products are obtained, and the dosage is carried sufficiently high. Preseason treatment, of course, is preferred, but very good results can be obtained in from 25 to 40 per cent of cases with co-seasonal treatment.

Animal Emanation Cases.—In patients who are sensitive to dog and horse hair, treatment by desensitization with the specific protein is very satisfactory. Since automobiles have become so prevalent, in a large per cent of the cases it is not necessary to desensitize to horse hair, especially children in the city. In case of dog hair, on account of the prevalence of dogs both in the city and country, it is wise usually to desensitize. If cats, birds, Belgian hares and other pets are eliminated from the household, as a rule it is not necessary to desensitize to them. It should be remembered that upholstering often contains rabbit hair. Many little asthmatic patients are sensitive to feathers. In treating these patients it is important to eliminate from the home all feathers of any sort that might be present in bed pillows, sofa pillows, feather ticks, and so on. The percentage of patients sensitive to animal emanations ranks extremely high.

Dusts.—Orris root is present in practically every home, in the form of some cosmetic, especially face powder. Quite a number of children become sensitized to orris root, and the treatment in every case should be desensitization, which is very satisfactory. It is possible to remove orris root from the home, yet if the child is taken to church, to school, to a theater, or almost anywhere that is enclosed, orris root is in the atmosphere.

Foods.—The percentage of patients sensitive to foods is a prominent but minor factor compared with those sensitive to animal emanations. Some authorities suggest desensitizing against eggs or wheat, although it is much easier to eliminate that food from the patient's diet. As a rule there are few foods to which the patient is sensitive and they may easily be eliminated without harm.

Treatment of the Non-sensitive or Bacterial Type.—In true asthma or with a bacterial invasion such as follows measles, or pertussis (and asthmatic bronchitis) the free use of iodids seems to be most efficacious. Potassium iodid used in full doses liquefies the secretions and thus enables the patient to expectorate large quantities. This is especially true if there be a dilatation of the bronchial tubes. Later, or in the interval, the syrup of hyperiodic acid or syrup of ferous iodid has a favorable action. While positive cure is possible in but a small number of cases, much may be done by way of prophylactic treatment. There is a tendency to repetition of attacks in practically all cases. But by proper management we think the number of attacks may be reduced by 50 per cent. By continued care of these cases before the age of 14 years, much of the chest deformity may be prevented or lessened while the bony structures are soft. It is a great misfortune for the child to go into adult life lacking the normal contour of the chest.

According to Pottenger's theory, certain cases by virtue of a causative, vasomotor rhinitis, require the use of thyroid, parathyroid and calcium, internally and the actinic ray generally, and locally in treatment.

Empyema.—This serious handicap may possibly be avoided by early and constant supervision.

Climate.—Certain cases of asthmatics are relieved from their attacks by climatic changes. Some cases do well in a dry climate, probably because they get away from the specific protein to which they are sensitive or perhaps because of the resulting dryness of the mucous membrane, which makes the absorption of the offending protein difficult. The percentage of cases getting permanent relief, however, is probably not over 10. Many of them have temporary relief for a few weeks or a month. Since the percentage is small, we believe that before parents change climate on account of an asthmatic child, which many times means a great deal of sacrifice financially, they should be urged to have the child studied from an allergic standpoint. If any troublesome question arises there should be consultation.

CONCLUSIONS

(1) Asthmatic cases are divided into the sensitive and non-sensitive types.

(2) Skin tests are the method of choice in diagnosis and should be repeated many times in some cases.

(3) Animal emanations, as a protein group, are the most common cause of asthma. Pollens rank second.

(4) A family history of allergy was obtained in 64.8 per cent of cases.

(5) Of our series, 44 per cent began having asthma before they were 5 years old.

(6) Asthma in children under 10 years of age is frequently atypical compared with adult asthma.

(7) Bronchitis relieved by adrenalin hypodermatically should make one suspect protein as cause.

(8) General management and advice concerning food, sleeping rooms and avoiding offending animal emanations, is important.

(9) Desensitization to orris root and pollens, if they offend, is very satisfactory.

(10) Few cases of asthma are directly due to infected tonsils or paranasal sinuses. Such infections should be removed, however, to increase the general resistance of the patient.

(11) The diagnosis of cause of asthma and specific treatment requires more detailed work than a busy pediatrician has time for. Best results can be obtained by placing these cases under the care of someone working in the field of allergy.

DISCUSSION (Abstract)

Dr. I. S. Kahn, San Antonio, Tex.—In dealing with pollen asthma in children, I have been unable to detect the slightest difference from the manifestations of this ailment in adults. The skin tests show the same proportion of correct etiological positives. The cases vary in degrees of hypersensitiveness requiring high or low atmospheric pollen concentration for symptom production precisely as in adults, as large doses of adrenalin are required for temporary relief and as high doses of pollen extracts for desensitization.

The hay fever preceding or accompanying pollen asthma in children, as far as I can determine it, seldom consists of violent sneezing spells, but usually is a more or less periodically blocked nose with constant or intermittent coryza, the etiology of the condition being frequently ascribed to adenoids.

Acidophilic increase in the blood count and the diagnostic use of adrenalin will differentiate between the two conditions.

Dr. Ray M. Balyeat, Oklahoma City, Okla.—Dr. Taylor mentioned heredity as an important factor in asthma. In a group of cases which we studied, 64.8 per cent gave a history of allergy in the family. I feel that it is of considerable importance to take a careful history in regard to allergy in the family. If two children came into my office with wet noses, one of them giving a definite history of allergy in the family and the other no history at all, I should work a long time to find a protein the cause of the first case, but would spend less time on the second. The signs of protein sensitivity in children are considerably different from those of adults. We find many children with a history of sniffling from the time they are very small, then with a history probably of bronchitis a little later in life, but no attacks of expiratory dyspnea until after 10 years of age. Many of them have atypical forms of croup. In my adult cases I get a history often of a peculiar form of croup in their early life and asthma in their teens. It is very common to find a history of eczema or hives in the first two or three years of life, then frequent nasal colds for three or four years, followed with bronchitis and later with paroxysmal attacks of expiratory dyspnea. Before treatment of any kind is instituted in these cases one should spend much time in investigating the cause and making sure that he has chosen the right proteins as the offending ones. It is common to find a child who is sensitive to pollens, animal emanations of various sorts, foods and also probably dusts. It is reasonable to believe that some of these are playing probably no part at all in the trouble, and, unless one uses care and judgment in choosing the offending member, treatment will be unsatisfactory.

Those whose condition is due to pollens are comparatively easily handled by desensitizing with the specific protein. Those who are sensitive to animal hair should be kept away from animal emanations, and any case sensitive to dog or horse hair should be desensitized.

It is the rule in the asthmatic child to find that the tonsils have been removed and usually they have been told by the nose and throat man or family physician that removal of the tonsils will probably eliminate the asthma. In only about one case in a hundred does it remove the cause. For any child with definitely infected tonsils, involved sinuses, or with infections in any other part of the body, surgery should be used to clean up the infection in order to increase the resistance of the patient. But one should be extremely cautious in telling the parents that taking out tonsils or polypi from the nose will cure attacks of asthma.

The fathers and mothers of nearly every asthmatic child ask about climate. Only about five per cent of cases benefit to any extent by change of climate.

Dr. Taylor (closing).—Clinicians have noticed the occasional disappearance of asthmatic attacks following severe infections.

I wish to emphasize the importance of having the skin tests made by one skilled in this work. Lack of this is the cause of much discouragement for the average pediatrician.

PROGRESS IN ROENTGENOLOGY*

By HOWARD E. ASHBURY, M.D., F.A.C.S., Baltimore, Md.

Our knowledge of medicine and surgery has progressed in a curiously uniform way. Up to the middle of the last century we knew very little

*Chairman's address, Section on Radiology, Southern Medical Association, Nineteenth Annual Meeting, Dallas, Tex., Nov. 9-12, 1925.

more of the actual causes of diseases, the great scourge of plagues, than did the Greeks. The surgery practiced at that time was medieval until the discovery of ether anesthesia by Dr. Crawford W. Long, of Athens, Ga., in 1842. Later Pasteur's discoveries of a *contagium vivum* in the form of bacteria established the science of bacteriology which led to the development by Lister of antisepsis and aseptic surgery. "With their advent there came a light that brightened more and more as the years gave us fuller knowledge" (Osler).

The fourth great epoch in the history of surgery was the discovery of the x-ray by William K. Roentgen. Here again we have another light of equal intensity, that has illuminated many of the dark paths of medicine and surgery, adding further brilliance to the period which laid the foundation for preventive and modern medicine and aseptic surgery.

HISTORY OF ROENTGENOLOGY

In the early part of November, 1895, just thirty years ago, Roentgen reported his discovery of the x-ray so it seems fitting on this occasion in our discussion of the progress of roentgenology to eulogize the discoverer of this remarkable physical agent and the pioneers who have died as martyrs in the study of it.

Wilhelm Konrad Roentgen, German physicist, born in Lennep, Prussia, March 27, 1845, was educated at Zurich, became Kundt's assistant at Wurzburg in 1870 and at Strasburg in 1872, was made lecturer at the latter in 1874 and professor extraordinary in 1876. In 1879 he was appointed professor ordinary at Giessen. In 1888, he returned to Wurzburg as Professor of Physics at Royal University where he remained until 1899 when he went to Munich. While at Wurzburg Roentgen found, by an accident which he had the genius to analyze, these invisible rays which he named x-rays. It is said by those who have visited him that he took no practical interest in the x-ray after his announcement and would refer visitors to others whom he said knew more about it than he. It is remarkable, however, that his masterly treatise has left practically nothing in a physical way to be added to his original description of the x-ray. He was given the Nobel Prize in physics in 1901. He died on February 10, 1923.

One can not pass over the early years of the specialty of roentgenology without bowing his head in mourning over the loss of many beloved colleagues who as pioneers gave their all for the profit of those who followed. One cannot mention them all by name but they are nobly represented by Caldwell, Leonard and Dodd. As a memorial to Eugene W. Caldwell, the American Roentgen Ray Society established "The Caldwell Lecture," which is usually given by some one of note at the annual meeting of the Society each year.

The Leonard Prize, also was established by the American Roentgen Ray Society, for the best piece of scientific work of each year, in memory of Dr. Charles Lester Leonard. The Laboratory of Roentgenology of the Massachusetts General Hospital is a memorial to Dr. Walter James Dodd who died December 18, 1916.

The first ten year period following the discovery of the x-ray was devoted principally to the development of apparatus, technic and elementary education. We learned the simple elementary lessons and marveled at the actual depicting of fractures, dislocations, foreign bodies and calculi. Many good results and many failures were experienced in therapy. The danger of over or continuous exposures, much to our sorrow, was recognized. Numerous reports of things accomplished by the x-ray were reported. There were only two books, to my knowledge, published by American authors, during this period, that of William and that by Pusey and Caldwell.

The second ten year period wrought marvelous changes. Through the efforts of Clyde Snook and Harry Waite, the transformer was substituted for the coil with the motor rectification of alternating current replacing the various types of interrupters for direct current. Gas tubes were replaced through the development of the Coolidge tube in the Research Laboratory of the General Electric Company by Dr. W. D. Coolidge in 1913. At the same time the manufacturers of photographic plates became interested and gave us very much better and faster x-ray plates and advocated tank development. The introduction of a satisfactory American x-ray intensifying screen by the late Dr. H. Threlkeld-Edwards in 1912, contributed greatly to the development of interest in gastro-intestinal diagnosis.

The hospitals realizing the importance of the x-ray laboratory gave more space, better ventilation and improved apparatus. The improvement in technic that naturally ensued allowed the x-ray men to devote their entire attention to diagnosis and therapy. The literature began to pile up. New books were published. The study of living pathology began, which has revolutionized diagnosis and made it possible for the physician, surgeon and specialists materially to improve their methods of treatment.

The third ten year period has contributed richly in new diagnostic methods, such as the use of air, carbon dioxid and oxygen in pneumoperitoneal diagnosis, ventriculography, cystography, etc., the use of opaque media in urography and the sodium tetra-iodophenolphthalein dye in gall bladder diagnosis. The development of cholecystography following the discovery by Dr. E. A. Graham and his associates of the tetra-iodophenolphthalein dye for visualization of the gall bladder, promises to forge the final link in the chain that will place the roentgen diagnosis of gall bladder diseases on an equal footing with that of other gastro-intestinal diagnosis.

Bone pathology has reached a higher plane of accurate diagnosis by the concerted efforts of the radiologist, the pathologist and the surgeon. The classification of bone diseases from purely clinical and roentgen characteristics is generally recognized and has aided materially in the early recognition of benign and malignant bone tumors. In this connection I wish to advise the roentgenologist to familiarize himself with the work of the Sarcoma Committee of the American College of Surgeons in respect to the classification of bone tumors.

The roentgenologist contributes suggestions and makes requisition on the ingenuity of electrical engineers for improvement of apparatus. Dr. Hollis Potter's contribution to roentgenology in the development of the Potter-Bucky diaphragm, places him on an equal footing with Snook, Caldwell and Coolidge. These men, through their interest in the physical side of x-ray, have made it possible to approach a perfection of technic that leaves little to be desired.

A PAUSE FOR WAR

Dr. Lewis G. Cole was working on a moving slot machine to cut out secondary rays in roentgenography when War was declared which put an end to his endeavors. As President of the American Roentgen Ray Society he immediately offered the support of the American roentgenologists to the Government and with others, organized a school of instruction in military roentgenology.

The service rendered by the American radiologist in the World War is a chapter of history filled with glory and sacrifice. The Southern men contributed famously, both in number and caliber. This service has reacted very advantageously to our present progress. Most of the men trained who are now practicing roentgenology, are a credit to the specialty. All of those who served have been benefited and would respond a second time if the necessity arose.

PROGRESS IN DIAGNOSIS

Our progress in roentgen diagnosis is naturally due to the interest aroused in the medical and surgical specialties and in the minds of the internist and pathologist. The roentgenologist has contributed liberally, assuming the entire responsibility for errors in order to centralize responsibility. So much, however, could never have been accomplished without the team-work that has prevailed in the large American clinics.

In most of the diseases in which the roentgen findings are known there is a diagnostic accuracy which compares favorably with, and in many instances exceeds, that of any of the special methods of examination. Its importance is second to none. Dr. Richard Cabot, of Boston, remarked before a large body of medical men not so long ago that of all the laboratory examinations he would feel the loss of the x-ray most of all. There is a tendency for the roentgenologist to confine himself to diagnosis, leaving therapy to the radiotherapist. This is manifest in the present tendency of group practice among roentgenologists. Certain members of these groups do the diagnostic work, leaving the therapy to a member of the group who has had special training in that line.

PROGRESS IN THERAPY

The foundation of our present knowledge of radiotherapy was laid in the first ten year period. Histological changes produced in normal skin by the x-ray were reported in 1897. It was thought at first that x-ray dermatitis might have been produced by deposits of foreign material driven into the skin from the tube terminals and glass walls of the tube and a diligent search was made by microscopic study of the tissue for the presence of platinum, glass, dust, etc. No foreign material was seen but the cellular changes were noted. The histological changes taking place in the various diseases of the skin and appendages after exposure to the x-ray were known, including superficial carcinoma and lupus.

The effect of unfiltered x-ray on tissues was carefully observed and the time of appearance of reaction, cumulative effects and susceptibility were noted. It was known that the x-ray had no bactericidal properties.

Kienbock, in 1902, described a technic using a "normal exposure" which corresponded to our erythema dose, and advised either giving it at one sitting, in "massive dose" using a "radiance of medium intensity" for 20 minutes or dividing the dose five minutes two or three times a week until the skin showed signs of redness. The

"fractional dose" prevailed. While aluminum filters (known at first as screens) were used as early as 1896, it was not until the second period when the transformer came into use that filters were used to any extent in deep therapy. With the advent of the dosimeters, like that of Kienbock, Holzknecht, Hampsen, etc., the first standardization and measurements of dosage began. With the advent of the larger machines, better tubes, more accurate dosage and greater protection, marked improvement in results followed.

With the advent of the Coolidge tube and radium the whole phase of therapy changed. By the use of filters, cross-firing in deep therapy permitted heavy doses to be given in pelvic and other deep seated diseases with what beneficial results you all know. It was at this time that radiation sickness made its appearance and was described very fully by Pfahler, in 1918.

The treatment of goitre dates from about 1907, and has always played a prominent role. In 1918, E. F. DuBois advocated basal metabolism estimations as controls in the treatment of goitre, putting it on a still sounder basis. In September 1920, Dr. Coolidge and Schmitz brought to this country the first news of the new deep therapy by use of high voltage x-ray, highly filtered, at a long distance, with long exposure. The use of such large doses required more accurate measurement of dosage; and for this purpose the ionization measurements became necessary. When facilities for handling an ionoquantimeter are not available, the calibration of one's apparatus by a trained physicist at frequent intervals is advisable.

With the use of the new deep therapy men were proud to report long exposures from two to eight hours. The Frederick Dessauer gross-section charts for measurements of depth dosage and the "lethal cancer dose" were hailed with great expectation. Later, reports of the ill effects on the normal tissue following the intensive treatments began to appear. Injuries to the liver and lungs were reported and a great deal of trouble was experienced in the control of radiation sickness. So the pendulum swung back and the radiologist reverted to smaller dosage and a few radiologists advocate fractional dosage. You are all familiar with the present status of superficial therapy. The x-ray is the chief instrument in the armamentarium of the dermatologist. He would be at a loss without it. In the non-malignant adenopathies and various diseases affecting the blood we give temporary relief and prolong the lives of the sufferers somewhat. Tuberculous adenitis is approached with more confidence but this as a rule is not a fatal disease. The treatment of superficial epitheliomata is quite satisfactory, but the treatment of metastasising cancer is disappointing.

It is said that if all factors in our present knowledge of cancer were brought into play, the mortality would be cut in half. In many instances there is a lack of team work, because of the disinclination of the surgeon to adopt an instrument that he cannot entirely control. The surgeon lacks the time and skill to use the x-ray as he would diathermy or electrocoagulation and consequently he must depend upon the radiologist. This division of labor necessarily means division of responsibility which reacts unfavorably on the patient and the method. There has been lacking a whole-hearted cooperation in the management of the treatment of certain diseases, especially cancer and goitre, and in most instances the radiologist has not been given a full opportunity on an equal footing with the surgeon.

THE FUTURE OF CANCER THERAPY

The management of cancer I believe will ultimately fall to the radiologist. In order to assume this responsibility he must of necessity be well trained in surgical diagnosis and technic, the physics of radiation, biophysiology and pathology. Such educational influences and experience are the fundamental requirements for successful therapy. The trouble in the past has been that the chief thing the average roentgenologist has had to offer was his knowledge of x-ray dosage and possibly the possession of a little radium. This with a mediocre knowledge of surgical diagnosis and no surgical training was not sufficient equipment. In order to treat cancer successfully the radiologist must know the gross and microscopic appearance of the lesions he treats. He should know the more recent biophysical phases of tissue reaction to radiation. He must be able to use any combination of procedures himself that may be indicated, such as electro-coagulation, implantation of radium, and deep x-ray therapy. He must know when and how to remove sections for study, when not to operate as well as when to remove glandular metastases, and must have a vast amount of technical knowledge that only a thorough surgical training can supply. I believe one of the reasons why the treatment of cervical cancer has been so successful is the skill of the gynecologists and radiologists who have done most of the work. The responsibility has not been so divided as in other forms of cancer therapy. A few x-ray men have acquired a great deal of skill in radiology

because they have had to, but by far the majority have not.

There is a widespread discouragement over the results in the present treatment of cancer. Mortality from cancer increased from 1900 to 1921 over thirty per cent. Halstead's radical breast operation has not improved the death rate and so far radiation has not done much more to effect statistics, but it has materially improved the comfort and happiness of the patient during the few hopeless years remaining. The absence of foul smelling ulceration, freedom from pain and local recurrences, etc., lend to the general well being until the end.

I am not in accord with the tendency of the radiologist to treat breast tumors primarily by radiation, because in doing so an opportunity is lost to determine the true pathological character of the tumor by study after removal. It has taken years of labor by the surgeon to teach the family doctor and the patient to have a lump in the breast removed at once. Anything that tends to weaken this position will be a step backward for medicine, but a majority of the radical breast operations are unnecessary mutilations, and add to the patient's burden a great deal of unnecessary suffering. Such operations are too often done when it is perfectly evident that mediastinal metastases are present. A simple breast amputation or excision of the tumor followed by postoperative radiation would do far more good. By availing ourselves of all the methods at hand and the close cooperation of the surgeon, biologist, pathologist, internist, radiologist, etc., better results are sure to be experienced.

THE FUTURE OF GOITRE THERAPY

Hubert A. Royster, in an editorial in the October, 1925, issue of *Surgery, Gynecology and Obstetrics,* said in part:

"We have been accustomed to speak of certain cases as being on the border-line between medicine and surgery. The divergence must be in the way of treatment, because in the bright lexicon of diagnosis there are no such words as medical or surgical. As doctors we must meet on a common ground and exist for a common purpose. We must focus ourselves on the patient and ask ourselves not how we can parcel him out but how we can best cure him. It is not all of medicine to write a prescription or to take a blood count. (And he might have added to give an x-ray treatment). Neither is it all of surgery to cut, nor all of operating to get well of the operation.

"When we say that all thyroid cases should be submitted to surgery or that none should be, or that the x-ray or medicine will cure them all we are certainly far from the truth. But if we say that all of these agents or methods have their place in certain cases we are very near it."

The treatment of goitre by x-ray should be in close cooperation with the internist. The x-ray man should be familiar with goitre classification and treat only those cases that are recognized as being amenable to x-ray therapy. The management of the case during treatment should be in accord with the present day usage of rest, administration of iodin if indicated, and control by basal metabolism estimations before and during radiation therapy.

One notices an acknowledged lack of statistical evidence to support the roentgenologist's claims for the superiority of roentgen therapy over the other methods of treatment. There is quite a necessity for a statistical bureau for compiling records and preserving them to meet the other specialties on an equal footing when comparing results of methods of treatment.

A physician roentgenologist should not narrow himself down to insisting that x-ray is the only satisfactory method of treatment for any group of diseases. If some other method of treatment offers a quicker and more thorough eradication of the disease, the radiologist should accept it. In realizing the limitation of radiation and knowing the necessary qualifications for its administration and control lies one of our greatest means of progress.

ECONOMIC FACTORS AND EDUCATION

The economic potential force of the layman's belief in the infallibility of the x-ray is a strong incentive for commercialization. Fortunately the high moral standard of medical men in America has prevented its very wide exploitation but a number of irregularities do exist.

The commercial laboratory has crept in, like the quack specialist and the optometrist. These agencies have never been a serious drawback to the progress of legitimate medicine so we need not be unduly alarmed. However the wise plan would be for the leaders in their several communities to keep in touch with such legislation as may influence roentgenology so that at least the laymen may not be licensed. Registration of lay technicians should be encouraged in order to control them; but a man or a woman known to engage in commercial x-ray work should have his registration revoked and be refused employment by physician roentgenologists.

The part-time x-ray man who practices general medicine does quite as much harm in a semi-legitimate way as the commercial laboratory. As a rule he purchases a machine and announces his intention to do his own x-ray work. This is done as a rule without any more previous train-

ing than that given by the agent who installs the apparatus. Again, an inexperienced man is selected from the staff of a new hospital which has installed an x-ray laboratory. He is sent away for a month or six weeks to some large clinic and returns with the impression that he is a full fledged roentgenologist. This procedure should be discouraged unless the roentgenologist who undertakes to give these short courses has the time and inclination to act as an advisor to the hospital in the capacity of a consultant until he feels that his man is safe to proceed alone. It is far better to discourage the whole proceeding unless the man in question is willing and able to go into training for at least a year and if possible longer in some large clinic. The hospitals requiring the services of a roentgenologist would do far better to appoint someone who has been trained and comes well recommended. His compensation need not be a burden on the hospital because the laboratory will soon pay its own way. The young roentgenologist when accepting such a position should be very cautious as to the nature of the agreement into which he enters with the hospital management, especially is this true of the salary or compensation and privileges. The roentgenologist should always retain a dignified position with all the privileges of the other members of the staff and leave himself free to practice in the community if he should desire. Quite a few hospitals employ young men and bind them with an iron-clad contract on a salary basis with the idea that the proceeds of the x-ray department will be used to make up deficiencies elsewhere in the hospital. A physician establishing his practice in the hospital leaves a great deal of it behind if he later wishes to have his office outside.

I believe a community, sufficiently prosperous to support a fifty bed hospital will draw enough work from the surrounding territory and nearby towns to enable the roentgenologist to devote his entire time to his specialty. If he is fortunately placed near a large medical center he should attend roentgen clinics regularly to make up for the lack of experience. To be a success as a specialist, particularly in roentgenology, a man's full time is required and then some. The ideal that I am sure we would all like to see would be a thorough grounding in the sciences, chemistry, physics, biology, such as is required for a B. S. degree in a first class college. Following his medical education in an A-1 school he should have a year on rotation service in a large hospital during which he should devote as much time to pathology as possible. The second year after graduation he should secure an appointment as a hospital interne in roentgenology where he could learn the laboratory routine, some diagnosis and possibly acquire a healthy respect for therapy, his spare time to be put in the autopsy room and pathological laboratory. At the completion of the year he would then be ready for a position, preferably in a large clinic as a resident or assistant where he would come under the influence of experienced roentgenologists. He is then ready to establish himself permanently. Medical schools and hospitals offer positions to men so trained and as a rule have difficulty in filling them.

The Mayo Foundation has, in its graduate department since 1914, required three years to receive the degree of Master of Science in roentgenology. Students who possess a special scientific mind are later recommended for the degree of Doctor of Philosophy in roentgenology. In England the University of Cambridge and Liverpool offer a diploma after six months work in the physics of x-ray.

In conclusion, the literal meaning of progress as its Latin derivation would imply (progrede, to walk forward) is to continue onward in course of action through a regular order of development toward new conditions and results. It naturally implies advancement, attainment, proficiency and skill, a steady constant forward movement admitting of pause, but not of retreat.

We have literally progressed. From a position of uncertainty roentgenology has reached a position of security. The radiologist is now an important member of the medical staff of the hospitals, medical schools and the communities.

The speciality was recognized by our Association in 1919 when this section was established and finally by the American Medical Association last year, truly a national acknowledgement of our position.

I recall an epigram "I am a physician practicing surgery" (Sir Berkley Moyniham). It was a great phrase written by a great surgeon. Let the x-ray man similarly remind himself daily, "I am a physician practicing roentgenology."

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THE PEPTIC ULCER QUESTION*

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There are few topics in medicine which challenge the serious consideration of a larger group of medical practitioners or the members of a larger number of modern medical specialists than peptic ulcer. Its popularity is attested by the very many references found in current medical literature and its universality by the fact that so many nations, tongues and peoples are investigating and writing upon it. American, English, French, Spanish, German, Austrian, Italian, Argentine, Venezuelan, and many other nationalities are represented among the authors. Etiology, pathogenicity, symptomatology, experimental production, relation to infection, diagnosis and methods of treatment, all come in for a liberal share of consideration in these publications.

It is obvious therefore, that the above caption gives license for an exhaustive discussion of any or many phases of the subject, but the writer does not presume or feel competent to do more than undertake a brief discussion of some of the more practical aspects, especially diagnosis, and more particularly, roentgenological diagnosis.

Definition.—Ulcerations varying in depth from superficial mucous erosions or slits to those involving the submucous muscular and serous coats of stomach and duodenum may be classified under the term "peptic ulcer." The name is given because of the usually rounded form and sharply defined edges, and was formerly applied to gastric lesions only. In later years it has come to be accepted as a general term for conditions of the small intestine as well. There are, of course, many variations of size, shape and depth. The penetrating type, and the perforating type are seen in all their various stages of form and depth. As the condition becomes chronic, there is more or less cellular infiltration with thickening and induration of the surrounding muscle wall, due to frequent exacerbation and scar tissue formation, thus giving rise to the so-called indurated ulcer.

Location.—They may occur in any portion of the stomach, but most authors agree that the majority occur at or near the lesser curvature, posterior wall, or pylorus, or have very close relationship to one or more of these anatomical divisions. The anterior wall, cardia and greater curvature furnish the smaller percentages. Our own series of cases will verify these observations and also will agree with recent reports to the effect that the perforating type is quite rare on the greater curvature.

In the duodenum, nearly all ulcers occur in the first or bulbar portion. I have seen only one elsewhere, that being in the second or descending portion. It was producing marked obstruction, which fact probably accounts in a large part at least, for our ability to identify it. The feathery, serrated appearance of this section of the organ offers much difficulty in the diagnosis of organic lesions.

Etiology.—The subject of etiology is perhaps of all the most obscure but the consensus of opinion seems to point to infection as the most frequent cause. Hyperacidity, inflammation, alteration of drainage, and trauma all perhaps play an important role, while disturbances of the nervous system, disturbances of the endocrin system, anemia (chlorosis) arteriosclerosis and syphilis are all under suspicion as causative factors.

Symptomatology.—The commonly accepted syndrome "pain, food, relief of pain" will perhaps apply in a large per cent of cases, especially duodenal. But the numerous variations and obscure combinations of these are so frequent that it is quite impossible to make a diagnosis from symptoms in more than 50 per cent of cases, according to eminent clinicians.

The syndrome includes pain coming on two to four hours after meals, which is relieved by food or gastric alkalis. The location of the pain, the time of onset and its relation to meals, and its relief by foods or alkalis, are rather variable factors, but the typical sequence just mentioned is the more common occurrence. Vomiting, hematemesis, epigastric tenderness, etc., are also factors which occur with lesser frequency and which are contributory. At the Scott and White clinic where this series of cases were observed, the conditions, or rather the reasons assigned by the clinical staff for which patients are referred for gastric x-ray study are the following:

(1) Pain or discomfort in the epigastrium or mid-abdomen.

(2) Chronic or recurring nausea with or without vomiting.

(3) Gaseous eructation or regurgitation of food.

(4) Hematemesis or melena with or without gastro-intestinal symptoms.

(5) Loss of appetite with anemia where there is

*Read in Section on Radiology, Southern Medical Association, Nineteenth Annual Meeting, Dallas, Tex., Nov. 9-12, 1925.

a possibility of malignancy regardless of lack, or presence of, other gastro-intestinal symptoms.

(6) Confirmation of previously made diagnosis.

(7) General debility with obscure general symptoms.

Considering the great variability of symptoms and the numerous obscure combinations and the frequent association of this with other diseases, and considering the ease with which roentgen examination is made and its generally admitted accuracy, the indications for its application have rightfully been extended by a large number of cases not heretofore included. This is borne out by the fact that our records show that nine patients are examined to one ulcer found: 690 ulcers in 6507 examinations, this number representing approximately 20 per cent of clinic admissions. To be sure, a fair percentage of the other eight have other gastro-intestinal pathology and a negative finding is often equally valuable. Duodenal ulcer also predominates in both sexes in the proportion of 72.5 to 27.5.

Economics.—The age of incidence is principally the third and fourth decades of life and the male was more frequently affected in our cases in the proportion of 72 to 28. There has occurred only one case of ulcer in a child in this series, while Proctor† reports three cases in children in a series of more than 8000. The disease usually becomes chronic and produces a long continued partial disability or frequent and variable attacks of total disability. Inasmuch as the diet plays a large part in the treatment and must be limited in quantity and quality during the active stage, the nutrition of the patient is more or less impaired with consequent impairment of productivity. Thus the element of economics assumes rather striking proportions.

Roentgenological Diagnosis.—The roentgenological examination consists in the administradition of two ounces or more of bariumized carbohydrate gruel administered from 8 to 8:30 a. m., and fluoroscopic observation six hours later, at which time an aqueous suspension of barium is given, no food having been ingested during the six-hour interim. Examination is better accomplished with the patient standing so that the food can be visualized as it traverses the esophagus and fills the stomach, the various manipulations being effected during the process of deglutition. This enables the examiner to press the stomach into various forms producing thickening and thinning of the opaque shadow, and to view the organ from every angle as the patient is turned from the anterior to the right and left oblique or posterior positions.

†Proctor, O. S.: Chronic Peptic Ulcer in Children. Surg. Gyne. and Obst. July, 1925.

It has been the contention of the writer that the abnormality or deviation from the normal smooth gastric or duodenal contour is the one unfailing evidence upon which to base a diagnosis of ulcer. The niche or projection of the opaque shadow is usually found to be in the form of a sharply defined accessory pocket or local prominence on the gastric or duodenal silhouette and represents the ulcer crater. The indurated ulcer, however, may appear only as a localized induration, the wall having lost its normal resiliency, and may not present a projecting crater, but will be recognized by the meniscus-like appearance under the manipulating hand. There are associated secondary signs such as a six-hour retention, or hour-glass contraction, which frequently occur, especially an incisura on the opposite curvature, but these signs are inconstant and may have other causes than ulcer. They should serve only to stimulate more diligent search and are not depended upon for diagnosis. The indurations are often quite difficult and sometimes impossible to differentiate from carcinoma. In doubtful cases the radiologist should not be charged with this responsibility, as very often microscopic section is required for settling the doubt. It has been our experience that any ulcer as large as 2 to 3 cm. should be considered malignant until proven otherwise.

The deformities of the duodenum are quite similar in their appearance to those of the gastric lumen, but may also be associated with such secondary signs as abnormality of peristalsis, or alteration of normal drainage and spasticities, but these again in turn are associated with other abdominal pathological conditions. Spasticity has been termed the arch deceiver in gastro-intestinal radiology, and is a sign of considerable value, if constant, and if it cannot be eliminated by the use of antispasmodics. If these contractions are extensive it may be difficult to locate a niche among them and one is perhaps justified in making a diagnosis in the presence of a constant deformity, whether due to niche or contraction. These deformities are the examiner's essential dependence and may be found to assume many shapes. They may be located at the base, the mesial aspect or in any portion of bulb, may produce an irregular narrowing or a clover-leaf deformity. A very small per cent of these may be due to cholecystitis with accompanying adhesions or even pancreatitis or appendicitis or other remote inflammations which give rise to reflex spasms. We have been guilty of making a diagnosis where such conditions were the exciting cause of the deformity. On the other hand, one can generally make a differentia-

tion by careful fluoroscopic manipulation. Sometimes even in spite of dense masses of adhesions surrounding the duodenum the bulb can be made to fill normally. The dilated and sacculated bulbus duodeni caused by various forms of obstructions and sometimes without a demonstrable cause, are frequently encountered and give rise to a chain of symptoms which require careful study.

The typical findings accompanying duodenal deformity are hypertonus, hyperperistalsis, and hypermotility. As the condition becomes advanced and as cicatricial contractions and organic reduction of lumen appear, the reverse of these, especially hypotonus and hypoperistalsis may be observed when obstruction occurs. Alternating periods of hyper- and hypoperistalsis may be observed in obstructive cases. After all has been said we finally come back to the original contention that the deformities of gastric and duodenal contour which are constant and characteristic and which are carefully differentiated under fluoroscopic manipulation, after extrinsic causes have been eliminated are the only dependable evidence upon which to base the roentgenological diagnosis of ulcer.

We have recently checked the records of 6507 gastro-intestinal examinations among which peptic ulcer was recorded as the diagnosis in 690 cases, divided as follows: duodenal, 501; gastric, 182; pyloric, 7. As will be seen, our staff does not consider every ulcer case a surgical one. Practically all of these have had medical and dietary treatment in one or another form, some in the hospital, some in the home, others ambulatory and others declining treatment. Practically all early cases in young people are given the benefit of medical treatment until they have proven refractory or until such complications as impending perforation, hemorrhage, obstructions, etc., are sufficient to warrant or demand surgical interference. Of the 501 duodenal ulcers, 140 patients have been operated upon, and 133 of these cases were found to have duodenal ulcer. Of the seven unconfirmed, two had cholecystitis with adhesions; two had carcinoma of the pancreas and three were associated with other abdominal lesions not directly connected with stomach or duodenum. Of the 182 classified as gastric ulcer, 51 have been operated upon and 47 confirmed. Of the seven classified as pyloric ulcer, two have been operated upon and confirmed, making a total of 193 operations, with 182 confirmations, 94.3 per cent. There were 14 records found in which the roentgenological findings were considered negative, in which definite gastric or duodenal pathology were demonstrated, 13 at operation, and one at autopsy. In one of these a small gastric carcinoma was found on the lesser curvature near the pylorus. One was a gastric ulcer, all the others were duodenal. These 11 were overlooked, some perhaps by their location and others by their inaccessibility or by the fact that their shallow craters produced little deformity, thus eluding recognition.

CONCLUSIONS

(1) Practically all nations are studying and discussing this disease, which proves its universality and frequent occurrence.

(2) The sexes are affected in the proportion of men, 72; women, 28. The third and fourth decades of life furnish the largest number of patients. The disease is usually chronic. Limited diet is an important element which reduces nutrition and consequent productivity. Thus the economic element assumes enormous proportions.

(3) The symptomatology is so variable that the clinical diagnosis is impossible in more than 50 per cent of cases. The x-ray examinations are reliable in 94 + per cent of positive diagnoses and 99 per cent of negative.

DISCUSSION (Abstract)

Dr. J. B. Johnson, Galveston, Tex.—The roentgen diagnosis of ulcer of the stomach and duodenum is not so easily made as one might suppose from listening to Dr. Wilson's paper. I do not say this to discourage the beginner, but the purchase of an x-ray equipment and the administration of barium meal is not all that is necessary for the roentgen demonstration of these lesions. As a matter of fact, it is seriously doubted that one can become proficient in localizing these lesions working alone. The committee of the American Roentgen Ray Society, a few years ago which was appointed to make recommendations to improve its own membership, stated that the gastro-intestinal branch could only be learned in association with a large clinic seeing a large number of cases.

The finding of these lesions is of prime importance for several reasons.

A patient suffering with upper abdominal or gastric symptoms is handicapped because of the actual disability from pain itself, and the mere fact of gastric disease is disconcerting because people are greatly mentally disturbed when their digestive organs are involved. It is important to find these lesions from the standpoint of the internist as well as to follow them during the course of medical treatment to observe any changes that may occur. It is important from the surgical standpoint to localize these lesions. Patients are more and more demanding a complete diagnosis of their condition before operative interference, in order that trauma be avoided by too much exploration. This to my mind is the prime reason why patients are largely afraid of surgery. The case is often not diagnosed properly before they are opened, and there is too much manipulation and pulling, producing much postoperative shock.

In conclusion, I would say that gastro-intestinal roentgenology is one of the most satisfactory procedures in medicine.

SURGERY

RAILWAY, INDUSTRIAL, GYNECOLOGICAL, OBSTETRICAL AND UROLOGICAL

THE SURGEON IN BONDAGE*

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In the year 1911 I happened, by good chance, to read a review of a book written by Rendle Short, entitled "The Newer Physiology in Medical and Surgical Practice." It was praised so highly that I secured it at once, and found, to my satisfaction, that the favorable criticism was fully justified. It was one of those rare books which seem to owe their birth to the strong convictions of the author, and which carry a message of deepest importance to the lucky reader. I read it from cover to cover with great pleasure and profit, and grew to value it so highly that it was my constant companion at the bedside and on all my travels. I found, to my dismay, that not only had I forgotten most of the physiology that I had learned in former years but that I was very ignorant of the advances that had been made since I was a student of medicine. It was a rude awakening, but, as it turned out, a very fortunate one, because it directed my collateral reading into the paths of physiology and chemistry with great profit and satisfaction to me.

I have been equally fortunate in recent years in living under the same roof with my two sons during their freshman and sophomore years in the medical school. I have kept pace as far as possible with their studies, relearning many things from a different angle and acquiring, for the first time, a vast amount of information about new facts that are fast revolutionizing the course of medical teaching and practice. It seems to me that I have great cause to be thankful, first, for having been awakened from the sleep of ignorance, and, second, for having been mentally fit to profit from an undergraduate course of study in the company of earnest students.

I often think of what might have happened had I not been awakened from the state of complacent bondage in which I found myself, and these thoughts have become so insistent that I am impelled to share them with you, hoping thereby to stimulate my contemporaries and to help the younger men, in whose hands the future of surgery lies, to avoid the slough in which I had fallen.

The relationship between the surgeon and physician has not always been that of social and professional equality. In the middle ages, up to about the year 1200, the teaching of medicine and surgery was chiefly in the hands of the monks who practiced widely among the laity outside their monasteries. It became such a serious hindrance to their religious duties that they were forbidden repeatedly by many of the Catholic Church councils to practice medicine, law, or pharmacy if it interfered with monastic life.

There seems, however, to be no evidence to show that the practice of surgery was looked down upon as a menial occupation, because we find that in 1310 the council of Béziers allowed priests and monks to practice surgery without question, but stipulated that they must first have a bishop's license.

According to Guy de Chauliac, the separation of medicine from surgery occurred in the time of Albucasis, about 1050, the result partly of Moslem religious feeling which proscribed the practice of anatomy and partly of the aristocratic tendencies of the age which despised manual labor and the arts (Parker's).

As time passed, the practice of surgery gradually fell into the hands of uneducated men, usually barbers who shaved and bled by turns. The social caste of the barber was very low, and that of the barber surgeon very little higher.

In France, at the time of Ambroise Paré (1510-1590), there were three classes of practitioners. At the top were the physicians, usually well trained in the medical literature of the times and able to speak and write Latin, which seems to have been an indispensable accomplishment. They were the prototypes of the physicians of the old school whom Molière delighted to satirize.

Next came the surgeons of the fraternity of St. Côme, where a College of Surgery had been

*Chairman's Address, Section on Surgery, Southern Medical Association, Nineteenth Annual Meeting, Dallas, Texas, November 9-12, 1925.

founded in the year 1279. They were trained in anatomy and surgery, and cultured enough to speak and write Latin. Their practice was supposed to be confined to the performance of major operations, such as cutting for stone and amputations. By reason of their distinctive dress, they usually went by the name of "surgeons of the long robe."

Lastly came the barber surgeons, called from their dress "the surgeons of the short robe," who were drawn from the uneducated classes, who knew no Latin, and whose duties were to bleed and to perform minor operations, such as the opening of abscesses. Their social and professional standing was so low that in the Prussian Army it was the duty of the regimental surgeons to shave the officers.

There was, of course, endless rivalry and bickering between these three sets of men on account of encroachments on one another's preserves. This unsatisfactory state of affairs continued in France until the year 1731, when the Academy of Surgery was founded, and in England until 1800, when the Royal College of Surgeons was established.

The picture of the Eighteenth Century physician, dressed in knee breeches, silk stockings, buckled shoes, long-tailed coat and cocked hat, with gold cane and snuff box, dignified to a degree, and frequently pompous, and arrogant, is not overdrawn. It was his privilege to make a diagnosis and to outline the treatment, prescribing drugs, but never soiling his hands with the menial offices of the profession. To him the letting of blood was abhorrent and unbefitting to his caste and, therefore, to be carried out by men of an inferior station in life.

Under the existing circumstances, it was natural that a rigid social and professional barrier should exist between physicians and surgeons, because the rank and file of surgeons were not only poorly educated but drawn from the lower orders of society. Equality was an impossibility so long as physicians had the education and culture and surgeons mere manual dexterity.

These rigid social and professional lines could only be crossed by men of unusual ability, masters not alone of the art of surgery but of the science as it then existed.

Such men were Ambroise Paré (1510-1590), Richard Wiseman (1622-1676), Jean Louis Pétit (1674-1750), Francois Chopart (1743-1795), Pierre Desault (1744-1795), Alexander Munro (1697-1767) and William (1718-1783) and John Hunter (1728-1793).

In England and Scotland the influence of Munro and William and John Hunter was remarkable, because their schools were the first to teach anatomy and surgery scientifically to students whose license to practice could be obtained only from the company of barbers and surgeons. In the Hunterian oration of 1877, Sir James Paget said that John Hunter, more than any living man, helped to make surgeons gentlemen.

In England in the year 1800, the company of Barbers and Surgeons was abolished and the Royal College of Surgeons was established in its place, with full control of the educational requirements of candidates who sought its license to practice surgery.

Its immediate influence on medical education and on surgical progress was shown by the rapid advance of scientific surgery under the teaching and guidance of such men as Sir Astley Cooper, Sir William Ferguson, Abernethey, Brodie and others. In their hands surgery attained a dignity equal, if not superior, to that of medicine. Leading surgeons were everywhere accorded full public recognition and were the recipients of the highest social honors.

Before the discovery of the anesthetic properties of ether, surgery was not a pleasant profession. Only a man of iron nerve could possibly have faced the racking ordeal of major operations on patients imperfectly narcotized, who felt keenly the pain of the knife and who struggled, moaned and shrieked continually, and often fainted from shock. The terrors of such operations have been truthfully depicted by many writers. The truthful and classical description of Syme's operation on Ailie, written by John Brown in "Rab and His Friends," is familiar to all. Even when the operation was completed, the ordeal was not yet over, because the patient was still exposed to the risks of infection. Few cases escaped frank suppuration. Worse still, more severe infections, such as erysipelas and hospital gangrene, were so common, and the post-operative mortality was so high that it was not an uncommon event for surgeons to cease operating and to close their wards for indefinite periods.

The discovery of the antiseptic treatment of wounds by Joseph Lister had the most profound effect on the development of surgery. At once regions of the body previously inviolate became accessible to operation. The mortality from amputation dropped to an astonishingly low rate. Joints could now be opened with little

danger, the abdominal cavity could be exposed with safety, and most operations of expediency carried out without the appalling infections that had previously been the rule.

The later development of aseptic surgery, which followed on the heels of the Listerian period, opened most regions of the body to the surgeon's knife; until, at the present day, the possibilities of surgery seem to be boundless, with practically no limit save that of physiological conservation.

The importance and dignity of surgery are now surpassed by no other branch of the healing art, and its value to the human race from humanitarian and economic standpoints is of supreme importance.

The surgeon has not reached this pinnacle by mere dexterity and sleight of hand, but by laborious and painstaking work. When we think of the surgeons of the last century, we honor most those who have left lasting proofs of their genius in anatomical and pathological observations. Mere mechanical dexterity has counted for little. Our stepping-stones in the progress of surgery are such men as Sir Astley Cooper and Sir James Paget in England, Billroth in Germany, Velpean and Malgaigne in France, and Mott and Gross in America.

Surgeons have always been ready to take full advantage of new scientific discoveries. The work of Pasteur was a beacon light to Lister; and Lister's later discovery of the antiseptic treatment of wounds stimulated an eager band of surgeons to attack regions which had hitherto been inviolate. Physicians, to their credit be it said, were seldom a drag on the wheels, although in some institutions, as I remember clearly as a student, some of the older men never ceased to protest against the encroachments of surgeons on the abdominal contents, and persisted in treating such conditions as perityphlitis and intestinal obstruction with medicines as a routine practice.

For the last 25 years, which may be called the true aseptic period of surgery, progress has been phenomenal. During this time not only has the mortality rate been reduced to a very low point by cleanliness and improved technic, but early operations have revealed pathological conditions which were unknown to our predecessors, who learned most of their pathology of the internal organs in the dead house. Both surgeons and physicians have had unrivalled opportunities of studying living pathology at the operating table, which have enabled them to correlate the clinical symptoms and pathological appearances of the very earliest stages of disease. Progress has been so rapid that it has been a hard matter to keep abreast of the times. During this period surgeons have been so busy developing the mechanical side of their art that I am afraid only too many have neglected the advances in physiology, chemistry and diagnostic methods, which have lately revolutionized internal medicine. The physician has been more fortunate. He has been forced to keep in close touch with the newest discoveries, or to fall hopelessly behind. The teaching of biochemistry in our oldest medical schools scarcely dates further back than the year 1910. It has now become so important that it occupies a very important place in the curriculum, and a still more vital one in the hospital laboratory.

At the present time the clinician cannot practise scientific medicine unless he can get accurate quantitative analyses of the constituents of the blood, urine and other body fluids. Prognosis and treatment depend largely on the laboratory reports, the accuracy of which is of vital importance to his patients. It is his duty to make the necessary requests and to interpret the findings, both functions carrying with them heavy responsibility, and frequent opportunity for errors which may cost the patient his life.

To most surgeons, laboratory methods are a closed book. They have a general knowledge of the significance of chemical reactions; they know the normal average percentage of urea and sugar in the blood; but they know little about the chemistry of these substances, and perhaps less about the metabolic processes by which they are manufactured in the human body. They argue to themselves, if they reflect on the matter at all, that it is not necessary to be burdened with such matters, which, after all, are the province of the technician. Such an attitude is unfortunate from every point of view. There is no reason to try to keep pace with laboratory details, but it is necessary to understand clearly the broad principles on which the various tests are based and the morbid physiology which has disturbed the normal chemical reactions of the tissues. A reasonable knowledge of normal metabolic processes and of physiological chemistry is absolutely essential; otherwise it is impossible either to make intelligent requests for laboratory examinations or to check up the reports when they are received. Discrepancies between clinical symptoms and laboratory reports always call for corroboration of the laboratory tests, and there is no surer way of keeping technicians up to a high standard of efficiency than

knowing that their findings are subject to challenge at all times.

As the captain and chief engineer of a ship are masters of the mechanism and function of every part of the wonderful creation that they command, so must we be able to direct in a purposive and intelligent manner the highly specialized hand of the scientific workers on whose labors the lives of our patients depend.

There is no bondage so hopeless as blind faith in reports without an intelligent comprehension of the pathological processes that call for them and the scientific principles on which they are based.

The x-ray has now become one of the most important aids to surgical diagnosis. It is so indispensable in abdominal and chest affections and in fractures and dislocations that we cannot imagine how it was possible in the past to have practised without its help. We are so apt to rely on it for accurate information that it is hard to resist the tendency to neglect other means of diagnosis, which should usually take precedence.

In the hands of careful x-ray operators, very few mistakes are made, but it takes years to educate the average man to a point where his interpretations are uniformly accurate and judicial. Experience is needed here perhaps more than in any of the laboratories, and unless the x-ray operator follows patients to the wards and the operating room he will never recognize his mistakes. It is very foolish for the surgeon to accept written reports. He should study the pictures for himself. Interpretations should be arrived at only after consultation with the operator. Written reports are frequently misleading and sometimes false. The right and left side of the body are sometimes confused, with dangerous possibilities. This has happened to my cases so often that I am always on guard against its occurrence. Of all laboratory workers, none can be more actively dangerous than an x-ray operator whose knowledge of normal anatomy and normal x-ray appearances is unsound. If the surgeon will make it a rule to be present at fluoroscopic examinations, he will not alone learn more, but will, from his clinical knowledge of the case, be able to correct many false interpretations.

The study of the pathological specimens removed at operation is of such vital importance that every stage of the examination should be carefully followed by the surgeon. The fresh specimen must be cut open or split into halves in order that its color, consistence, and contained fluids, may be observed in the natural state. By this means the surgeon gradually educates himself to recognize the true nature of fresh tissues in the gross. Afterwards the dissected or prepared specimen should be studied to familiarize himself with its boundaries and relations to other structures. Portions of tissue taken from characteristic areas should then be removed for microscopic examination. These areas should always be labelled so as to be recognizable on the gross specimen. This simplifies subsequent study. Finally the microscopic specimen should be studied by the surgeon himself in order that he may carry away with him an ineffaceable mental picture of the character and structural arrangement of the cells. In no other way can he qualify himself to make accurate diagnoses of tumors and other morbid tissues during the course of an operation. It is easy for a bystander at an operation to tell whether the surgeon is a pathologist or not by the rapidity with which he recognizes a growth by its feel and appearance.

A surgeon who neglects these opportunities of educating his senses, places himself in bondage to the pathologist, who, however well trained he may be, is apt to make serious mistakes in tissue diagnosis, unless he knows exactly where the tissue was obtained from and its relationship to the main mass of the tumor. Even the best pathologists will differ as to the nature of some of the common tumors. Some of us who have had the opportunity of examining the reports of the "bone tumor registry" can testify that there are often as many diagnoses as there are pathologists. The appalling mistakes that are made by pathologists of meager training in tissue work are so frequent that it is often playing with fire to accept their reports seriously. It takes so many years to train a tissue pathologist that they are rare as the mythical hippograph or unicorn.

From time to time clinical tests, apparently of great practical value, attract much attention. Some of them, like the tetra-bromphenolphthalein test in gall bladder affections, appear to have a great field of usefulness and are popularized rapidly. As a rule, the physiological and chemical processes have been carefully worked out on animals in the laboratory, but in many instances actual proof of their value in man rests on scanty clinical records, which hardly justify the claims made on their behalf.

Premature publication of new observations is always to be regretted, because it places in the hands of the profession information of an immature character which may lead to uncontrolled

experimentation with its inevitable crop of false deductions. As long as the health of the patient is not jeopardized by experimentation, there can be no valid reason to object, but when serious operations form a necessary part of the procedure the matter takes on a more serious aspect. With proper restrictions, explorations, which in reality are vivisections, are justifiable. If our world were Utopia, they would probably be entrusted to a few skilled operators trained in scientific methods whose deductions would be authoritative; but under present conditions any surgeon, whether he be a man of judicial mind or one of flighty purpose, may be called upon at the invitation of a physician to investigate these problems, and as a result a vast number of exploratory operations are being performed each year on gall bladders healthy to all appearances and unattended with any of the really characteristic clinical symptoms that are usually present in infections.

The relationship between the surgeon and physician in questions of this sort is apt sometimes to become strained, unless their standards and conceptions of what constitutes true pathology happen to coincide. And, to make matters worse, every surgeon has his own ideas as to the differences between a healthy and diseased gall bladder.

If these innocent looking gall bladders that are so frequently removed are truly infected, then surgeons will be forced to re-educate themselves afresh in gross pathology, because all ordinary accepted signs of inflammation and infection are entirely absent.

I, like most of you, have played my part in solving this problem, and have removed many gall bladders against my better judgment. These operations have been very distasteful to me, because I could not bring myself to believe that gall bladder infections ought to be operated upon, unless they were accompanied by some of the classical symptoms of inflammation. Only too frequently cases with vague symptoms of pain and discomfort in the upper abdomen, cases of hyperchlorhydria, neurasthenics with ptosis of the viscera, showing the absence of a gall bladder shadow after taking tetrabromphenolphthalein were brought to me for operation. I was compelled to refuse. As much as I respected the opinion of the physicians who conscientiously believed that the patients were suffering from biliary infections, I could not bring myself to agree with them as to the value of the evidence. I was unwilling to surrender my freedom of thought and action on any terms. It was not an easy course to take, but no other was possible.

There is a point where amiable agreement and co-operation with our associates must stop. We can travel with them in harmony as far as our honest convictions permit, but not one step further. When we have formed opinions founded on sound evidence, it is our duty to abide by them and refuse all compromise.

OSTEOMYELITIS*

By M. L. KLINEFELTER, M.D.,
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I shall classify this subject as follows: (1) hematogenous osteomyelitis; and (2) localized osteomyelitis, due to open wounds. Hematogenous osteomyelitis may be (a) acute; (b) sub-acute or (c) chronic.

Acute hematogenous osteomyelitis should most interest the general practitioner, because early diagnosis may be the means of saving a life, years of invalidism, or many operations. Many patients may be saved from permanent crippling or rendered less extensively crippled and less likely to bone metastasis.

In the acute form, this is essentially a disease of childhood and adolescence, and except in the distal phalanges where it occasionally goes directly to the bone from overlying infections, it is blood-borne. It results from infected abrasions, boils, sore throat, etc. It practically always begins in the metaphysis or the diaphysis adjacent to the epiphyseal line. It is accompanied by fever, sometimes slight at first, and gradually rising, or frequently the onset is accompanied by a chill and high fever, pain may be severe at the onset, or it may at first be slight, becoming more severe on the second and third day. There is as a rule some slight effusion in the adjacent joint. The effusion may be serous or slightly turbid and later distinctly purulent, as infection works through the epiphysis into the joint. The onset of redness varies according to the depth of the bone infected, or according to the amount of soft structure over the bone. Tenderness is the one important point in differential diagnosis and is always most acute across the epiphyseal line from the joint. In arthritis, the joint is more sensitive. I believe this one point should enable us to make an early diagnosis in prac-

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tically every case. Acute syphilis, rickets, scurvy, and even poliomyelitis must be considered, as well as arthritis, in the differential diagnosis.

Osteomyelitis of the pelvis offers greater difficulty in diagnosis than that of the extremities. The parts are rather deeply situated, and the condition must be differentiated from appendicitis, intrapelvic conditions, and an acute infection involving the hip joint. Again the most important point in differential diagnosis is localized tenderness over the ilium or other parts of the innominate bone, and the fact that sometimes you can get unrestrained motion of the hip joint for a limited degree of movement in certain positions in osteomyelitis of the pelvis. This is not the case in conditions definitely involving the hip joint.

Treatment.—Where the diagnosis is made, and we should not wait for redness, fluctuation and x-ray changes, I believe every case should be operated upon early. If one is in doubt as to whether he is dealing with arthritis or osteomyelitis, and there is decided effusion in the joint, the joint can be aspirated before the field is rendered septic, the needle wound sealed with collodion, and the fluid examined if purulent. If it is not purulent, it may be cultured also. This may be of great benefit later in case the condition lingers and becomes even more difficult to diagnose, as an arthritis. After an incision has been made over the diaphysis near the epiphyseal line and the muscles are separated, if the case has run a week or ten days, pus will usually be found under the periosteum at this point. This is especially true upon the flexor surface of the femur or tibia. If pus is not found under the periosteum, and as a rule it will not be during the first few days, the end of the diaphysis should be bored in the direction of the epiphyseal line, stopping short of the epiphyseal line in order not to infect the epiphysis. This operation should be done most carefully, and if it is so done no harm should result in case of mistake in diagnosis. However, this should rarely occur if one regards the rule that most acute tenderness is located across the epiphyseal line, near the joint, and if one carefully considers superficial infections beginning in the skin, etc. In the latter case it is just as grave an error to cut into the bone and set up an osteomyelitis, where we are actually dealing with infection of the soft tissues. If pus is found under the periosteum it is usually not necessary to go farther but is perhaps more conservative to drill the bone. If pus is not found, we should drill the bone, or at most chisel a small area, where we will usually find pus and again be content with drainage until acute symptoms have subsided. Then we must consider a more radical operation with a hope of eradicating the disease. I have not used intravenous medication in this stage. Here again the question of time of operation and character become the outstanding features.

In the sub-acute form of hematogenous osteomyelitis, we should be content with drainage, in my opinion, until sufficient involucrum has formed to maintain the length of limb and act as a bridge while new bone is forming. This is usually for a period of six weeks or more. If we feel it is necessary, as it rarely is, to do a radical operation earlier than this, we should leave a portion of the shaft in a place that will be accessible later for further operation after new bone has formed where part has been removed. If we remove the entire shaft subperiosteally before involucrum has formed, we not only have trouble in maintaining the length and contour of the part, but involucrum may not form and we may have a flail limb, which requires extensive bone grafting, much work, and frequently entire failure. Again, all the shaft that seems to be involved may not break down *en masse,* or form one large sequestrum, but may to a great extent be gradually replaced by new bone. Whereas at one time removal of the entire shaft may seem indicated, later probably small areas only will need radical work.

In chronic osteomyelitis, we deal with Brody's abscess, bone abscesses elsewhere, encapsulated and semi-encapsulated sequestra. As a rule, diagnosis can be made from a history of the patient's having had an acute osteomyelitis at a previous date, practically always during childhood. A history of typhoid fever is frequently given. As osteomyelitis may accompany typhoid fever, and also, probably many cases of osteomyelitis have been diagnosed as typhoid fever, with the osteomyelitis classified as a complication. These cases must be differentiated from sarcoma, carcinoma, bone cyst, giant cell tumors, lues, tuberculosis, Paget's disease, and other bone changes. The history, the physical examination and x-ray examination are of great importance in excluding the various bone conditions. Any one of these conditions may resemble the other very much in an occasional case, and every means should be exhausted in making a diagnosis. Frequently the removal of a specimen, for examination by a competent pathologist is necessary. The average case,

however, is comparatively simple if it gives the history of an occasional exacerbation, with fever, and a negative Wassermann. The x-ray examination as a rule in chronic osteomyelitis shows periostitis, bone proliferation and occasional sequestra. In the absence of a sequestrum, a very important point is an area of rarefaction, even though it be small. Another most important point, except in the differentiation from syphilis, is the fact that it has probably extended a considerable distance along the bone. A sarcoma is more likely to grow through the cortex than to follow the line of least resistance. In differentiating it from carcinoma the two outstanding points are, first, in carcinoma there may be a history of carcinoma in some other part of the body; and secondly, the fact that in carcinoma we have a destructive process not accompanied by osteogenesis. All the points of differential diagnosis cannot be gone into in this paper.

In the treatment of chronic osteomyelitis each case must be handled according to its merits. The cases have resulted from the types described, a very small percentage of them will cure themselves, and many are difficult to cure by operation. However, if they give trouble they should be operated upon at the proper time. If they do not give trouble they should probably be operated upon at the proper time, unless there is some contra-indication. They will rarely cure themselves permanently. They are always liable to give trouble locally and disable patients and they have undesirable constitutional effects on liver, kidneys, etc.

When should we interfere and how?

No case of chronic osteomyelitis should be operated upon unless there is something definitely to be gained by the operation. The cases should be drained only during a distinct exacerbation, but during quiescence we should remove any sequestra present, and thoroughly bevel the edges. If the edge of the cortex is first to bridge over, it thus creates a dead space, which will be there to stay, until relieved by another operation. The same holds true with bone abscesses and they frequently have to be operated upon during an exacerbation. At such a time they may be drained by gouge or drill, and operated upon later. So far as I know, most of the cases that are thoroughly beveled at the time of exacerbation, require a second operation, which is, of course, a little more extensive than preceding. Regardless of the time we choose to attempt the cure, the bone should be thoroughly beveled, and the wound should be closed by interrupted sutures, with drainage at one or more most advantageous points. The operation should be done with tourniquet as a rule, because these cases bleed. I very rarely pack the wounds, unless it is necessary to control the hemorrhage. Bleeding can usually be controlled by packing for a few minutes or by bone wax after the tourniquet is removed. If the wound is packed open for weeks it will not only result in disfiguring and disabling scar, but the bone will almost surely be infected again. Our incisions should be so placed as to leave the least possible amount of bone exposed, in case the wound does not heal properly. I believe the thicker the pad of soft tissues over the operated bone, the less disabling will be the scar and the better our results generally.

The fourth class of cases is that resulting from compound fractures and wounds penetrating the bone. Upon the one important point, prevention, we are fairly well agreed. There is a group of cases, especially oblique fractures, where the bone protrudes through the skin and where the protrusion is still present when we see the case. The skin is stretched tightly around the bone, and the case frequently gets along well if the bone is well iodinized, or rendered aseptic by some other agent, then reduced and immobilized. A case so treated should be watched closely for indications for drainage, and we should always realize that we are assuming a risk in handling it that way. The doubtful cases, certainly the cases severely compounded, with much laceration of tissues, should be properly reduced and properly drained to prevent as much as possible any direct exposure of bone. The wound should be dressed frequently and reduction should be maintained. The question of debridement and the use of Dakin's solution in civil practice I believe must be left to the judgment of the attending surgeon.

I use these measures very little, depending mostly upon drainage after reduction. Early drainage and immobilization in a badly compounded fracture are always indicated. When a definite infection has developed we consider nothing but drainage in the acute stage, but when we have a subacute or chronic condition with which to deal, the case should be inspected carefully for any pus pockets and they should be drained. Any loose denuded pieces of bone should be removed and sequestra as they exfoliate should be removed. This is definitely indicated. It is inadvisable in the average case to try to clean up the field thoroughly and bevel the bone to prevent pocket formation within its walls. The patient will recover in

less time, and with less bone involvement if we treat the situation more conservatively, at least during the sub-acute stage. When the condition has become thoroughly chronic the organisms have less virulence and the bone has more resistance. We can then treat the case as we do chronic osteomyelitis resulting from acute hematogenous osteomyelitis.

SUMMARY

(1) Acute hematogenous osteomyelitis should be diagnosed within twenty-four to forty-eight hours of onset in the average case.

(2) We should not wait for redness, fluctuation, or x-ray changes to make the diagnosis.

(3) Practically every case should be operated upon early and we should be content with drainage.

(4) The prognosis does not depend alone on the surgeon but is greatly influenced by the virulence of the offending organism, the resistance of the patient, and the extent of the bacteremia.

(5) We should carefully avoid injury to the epiphysis; avoid pathological fractures, dislocations and deformities.

(6) Intravenous medication may prove of great importance in the future.

(7) Sub-acute osteomyelitis should very seldom be operated upon radically, before involucrum is well formed.

(8) Chronic osteomyelitis should not be operated upon without definite indications and plans.

(9) The most important point connected with osteomyelitis resulting from compound fractures is prevention. All cases should be drained, reduced and immobilized early.

Wall Building.

DISCUSSION (Abstract)

Dr. W. K. West, Oklahoma City, Okla.—The history of these cases of acute pyogenic osteomyelitis usually shows that the x-ray had been taken two or three days after the onset of the attack but that none had been taken subsequently. It is a well known fact that the x-ray will show no bone change even in the most destructive types in less than two or three weeks. For this reason an earlier picture is misleading. Another point in the differential diagnosis is that the pain usually comes on three or four days before swelling, whereas in an acute infection of the soft tissue and the joint spaces the swelling occurs a few hours after the onset of the pain.

I wish to emphasize the point made by Dr. Klinefelter concerning the proper fixation of the joints above and below the involved bone. The leg or arm should be held in a fixed position to prevent contractions. In many instances the child recovers from the infection in the bone but has such extreme deformities due to contracted tendons with ankylosis that he is markedly crippled.

Dr. Thomas G. Orr, Kansas City, Mo.—I rarely have much difficulty in diagnosing acute osteomyelitis because I rarely see the disease in the acute form. Most of the patients that come to me with osteomyelitis are of the chronic type and perhaps have been drained before entering my clinic. A few of them have been treated for something else. I recall one recently that was treated for phlebitis of the femoral vein for several weeks before admission to the hospital. We found the entire femur involved in this case.

The general surgeon owes much to the orthopedic surgeon for the valuable teaching of the orthopedic principals involved in the treatment of osteomyelitis. Many such surgeons neglect the deformities of the adjacent joints and after the bone infection has healed the disability is prolonged for months because of these.

Dr. Klinefelter (closing).—I think Dr. West's points are well taken, and most of Dr. Ryerson's. I do not believe in radical treatment during the acute stage for two reasons: (1) the danger of overwhelming the patient with toxemia and bacteremia; and (2) the probability of doing unnecessary work and consequently damage to the bone, since we cannot estimate to what extent disease will limit itself if tapped early.

As to the complete removal of all or part of the shaft of bone during subacute or chronic stage, I claim it is too radical for the reasons stated above, and that disability and tendency to deformity following operation are too great; and that failure to secure final results in the way of a functioning limb, and even bone support is too frequent, basing judgment on general observations and on report of Dr. Baumann, who advocates this radical treatment.

COMPULSORY REPORTING OF ABORTIONS*

By J. GEORGE DEMPSEY, M.D.,
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New Orleans, La.

In my years of practice in obstetrics, gynecology and as statistician in taking the history and records of suffering humanity, as well as the varied causes of death, I have observed no situation which demands the attention of the medical profession, its teachers and educators, more than the reporting of abortions.

In this great modern country of ours, little or no attention is given to the recording of abortions. Recordation is not even made mandatory by our state legislatures, possibly with one or two exceptions. When we consider that a

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birth and death is recorded when the fetus has reached the fifth month of gestation, but that if abortion occurs previous to the fifth month no record is made of it, we at once realize the necessity of some tabulation. None of us can realize the number of abortions committed, because there is no way of estimating them.

The time is fast approaching when an intelligent survey of all pregnancies will be essential. We, of the medical profession, can do much to discourage this nefarious practice, by holding up to our womanhood the miserable pictures of suffering that ensue, ending ultimately in the operating room and in invalidism. Many abortions are due to what I call the "convenient abortionists," charlatans of a great profession who for a few paltry dollars will practice infamy. So well have they become entrenched in our everyday life, that a woman, whether she be pregnant or not, having passed the menstrual time by a single day, hurries to these pseudo physicians to be dilated and thus to have a normal menstruation.

There is seldom justification for a physician to commit an abortion. Our old country practitioners will tell us of many cases in which they took a chance, leaving the work of God in the hands of God, and the patient after delivery of a full term child, improved in health and was none the worse for her experience. It is an open question whether any good results from such practices and in my opinion no good comes from the practice of abortion. I recall cases of pregnancy complicated with tuberculosis. Authorities claim that a woman with tuberculosis can have a full term normal child, and may have a second normal child, but may never have the third unless the active tuberculous lesion is arrested between births. But in my experience, women have fully recovered even after the birth of a third child. I have never advocated abortion in cases of pulmonary tuberculosis in pregnancy or, in fact, in any cases.

The only remedy that will effectually exterminate the criminal abortionist, whether mid-wife, nurse or physician, is legislation. Legislation should make compulsory the reporting of all abortions, whether those numerous accidental abortions caused by advanced disease, laceration of the uterus, or sudden shock to a weakened anatomy and the possibility of a spontaneous rupture of the sack, or whether the abortion is due to the deliberate desire to destroy the embryo. All should be reported. Provision, however, should be made to accord the innocent, accidental abortionist, the greatest consideration.

In conclusion, let me thank the Section on Obstetrics for the space allowed for my presentation of this thought. If we can each return home bearing this thought in mind and applying it to the home conditions, and save some ignorant girl or woman, by education along these lines; if we can bring resentment and shame upon the deliberate and guilty, thus stopping these sinful practices, we will have done much for the betterment of our social conditions and rendered a real service to our country.

UROLOGICAL PROBLEMS IN CHILDREN*†

By JOHN R. CAULK, M.D., F.A.C.S.,
St. Louis, Mo.

It may appear presumptuous for me to offer any diagnostic or therapeutic suggestions to men so familiar with the general pediatric problems. My great interest in urological studies in children has prompted me, however, to bring to your attention some of the special conditions and to discuss them with you from a urological viewpoint.

Juvenile urology has been rather tardy in its development and many diagnoses have been speculative. Some have been confirmed or refuted by exploratory surgery, others by autopsy discoveries. Many infants have passed to the autopsy table without the slightest suspicion of urinary disease. This is no more than could be expected in the earlier days owing to the lack of accurate methods for urological investigation, but at the present time such uncertainty should not prevail. It has been in the last decade that a real advance has been made in the study of these problems. Beer and Hyman were among the first to call attention to the importance of thorough investigation of the urinary tract in children. In 1918, Hyman reported an analysis of 30 cases of diseases of urinary organs in children which he and Beer had studied. Kretschmer and Bugbee have also written on this subject. They have demonstrated that complete urological examination is possible at a very early age. In the Childrens' Hospital of St. Louis we have for a number of years made accurate

*From the Dept. of Urology, Washington University.

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studies in quite a number of children when there were definite indications for such an investigation.

The scientific methods for studying urinary diseases in the adults have been applicable to children only in recent years, since the development of the small calibered cystoscope with its accessories. It is true that there are facilities for the competent study of the urinary organs in the majority of children. This applies particularly to girls, so that at the present time, except in very young boys, this study is possible of performance. In spite of this many children are treated symptomatically for long periods of time without relief and without special study. It is also quite shocking to see the inordinate number of explorations on these organs in children without the slightest attempts to clarify the diagnosis by methods which are at hand. This unfortunately occurs in some of the best clinics in the hands of experienced men who still believe that exploration is safer than urological manipulations. This same idea was generally held in the earlier days of such applications to the adult, and time and results of such study will bring the same transformation to children. Since the symptomatology and physical findings of several of the more frequent diseases of these organs are interlaced, it is often difficult, except by special means, to differentiate the location of the fundamental lesion, hence exploration may be misdirected and often is. On the other hand, one may often by simple studies definitely determine the nature of the pathological condition.

It is not my policy to subject all children to immediate cystoscopic investigation. This is really reserved for definite indications where other measures of differential diagnosis have failed. There are several less extensive procedures which may help a great deal in the solution of the problems. In cases of urinary infection, it is important to know if the process is a primary one in the kidney itself, or if it is secondary to a congenital defect, particularly an obstructive lesion which is the productive agent in the causation of infection. Children as well as adults who have kidney infections secondary to obstructive lesions are more tolerant to manipulations than those suffering from primary conditions in the kidneys themselves. The most important diagnostic aids in determining the applicability of the individual to an immediate complete urological study is, in the first place, to determine whether or not there is an obstructive condition by gaining evidences of such obstruction by catheterization and later by means of cystogram. Secondly, it is of paramount importance to be thoroughly cognizant of the total renal function. For this reason, the 'phthalein tests and blood nitrogen studies must be made. In case the nitrogen is high and the 'phthalein is low, indicating gross renal disturbance, any manipulations may be quite serious, as the reactions are sometimes pronounced.

I had a death following cystoscopic investigation of a child of 12 years of age who had shown evidence of a double pyelonephritis since infancy. At the time I saw him the blood nitrogen was very high, the 'phthalein scarcely perceptible. Following a rapid cystoscopic examination and ureteral catheterization, which was done with the greatest ease and without the slightest apparent trauma and after which the child did not appear at all disturbed, there resulted at the end of eight hours a terrific reaction with fever of 108°, later suppression of urine and death.

I have never seen such a reaction in unilateral disease. With a normal kidney reserve such a circumstance should not be expected. It certainly demonstrates, however, the importance of appreciating the seriousness of such a problem before entering into it. To bring out the first point which was mentioned, let me say that this condition was primarily a double pyelonephritis as far as the urinary tract is concerned. I have seen numerous children with as low function and high nitrogen due to obstructive conditions in the lower tract who would after a preliminary course of drainage tolerate such procedures without the slightest manifestation of serious consequence.

The child is subject to all of the maladies to which adult flesh is heir with the exception of complications of pregnancy and the enlarged prostate of the aged and cancer. But to offset this there is an enormous preponderance of congenital malformations in infant life which seldom allow development to the adult. Bugbee, in a recent analysis of 117 autopsy cases, showed that 101 died within the first year. I shall cull through this realm of diseases and select what seems to be the most important to bring to your attention as practitioners of pediatrics.

URINARY INFECTIONS

Urinary infections in children are exceedingly common. The so-called pyelitis usually tops the list in frequency. Since 1916, there have been admitted to the St. Louis Children's Hospital, 452 cases with the diagnosis of pyelitis, 2.5 per cent of all admissions. It is probable that most of the renal infections in children are blood borne, but no one can deny that ascending transportation occurs in many instances. Whatever

may be the method of infection, the child is taken acutely ill with fever, pain in the side, leucocytosis and pyuria. It is seldom difficult to diagnose an acute renal infection in the child, but the extent of such an infection and the associated phenomena frequently require special study. The urinalysis is diagnostic and should always be made. This statement may seem rather ridiculous, but it is surprising how many children one sees with such acute conditions who have not had one. The resulting febrile reaction in many cases has been held attributable to such things as malaria, typhoid, enteritis, etc.

The ideal treatment of acute pyelitis would be an immediate emptying of the renal retention as is the method in the adult in order to protect the renal cortex from back pressure, but from the fact that so many of these children are relieved by alkali treatment in large doses and copious flushings with water, attention to bowel elimination and eradication of focal infections, particularly nasal and tonsillar, I see no particular reason for immediate cystoscopic and ureter catheter drainage except in older children. If the process does not promptly subside or if it subsides and there are recurrences of this infection, then one must insist upon accurate study to search for the cause. The most common cases are congenital obstruction either at the ureteropelvic juncture, the vesical end of the ureter, the internal orifice of the bladder, or the prostatic urethra, neurological defects and foreign bodies.

In most instances one will find one or the other of these defects in the background. A previous hydronephrosis or hydro-ureter and hydronephrosis has become infected. A certain number show definite pyelonephritis either unilateral or bilateral without any demonstrable mechanical cause and are purely renal. In the workup of such conditions the same general methods as are followed in the adult must be applied. As has been previously stated, the renal function must be determined by tests of elimination and retention. If the condition seems bilateral, the source of trouble is usually found at the internal vesical orifice either as a contracture, valve formation, or nerve disturbance, or there may be a bilateral ureteral obstruction more commonly located in the intramural part of the ureter, from congenital valves or sclerosis. A great deal of this may be determined without cystoscopic study. Abdominal palpation will reveal renal or vesical enlargement. The next effort should be an attempt to determine whether or not there is a residual urine. For this a catheter is passed into the bladder after the child has voided. In the case of infants or very small children a small ureteral catheter will serve. If the child is too young to void on suggestion he or she may be watched and the catheterization done following the act. Unless there be high residual which needs drainage before further study, a cystogram should next be done not only to determine the contour of the bladder, but to see if there is reflux up the ureters with dilatation on one or both sides. In vesical neck obstruction this is most commonly bilateral, although the symptoms may be only on one side. Should there be no such regurgitation or evidence of vesical neck obstruction, a further search for ureteral or renal conditions is necessary.

Routine x-ray should always be made, not only for its importance in disclosing lesions in the urinary tract such as stones and foreign bodies and calcifications, but also for the purpose of detecting defective conditions in the spinal column such as spina bifida. Cystoscopic investigation in children usually requires gas anesthesia. The anesthesia takes but very short time, since such an examination is usually brief as far as manipulative features are concerned. Thorough study of the bladder is made, looking carefully at the orifice, then to the cavity for associated lesions such as diverticulum, stone, tumor and inflammatory conditions. Catheters are then passed into the ureters, obstructions are noted, as well as the presence or absence of retention in one or both kidneys. The anesthesia is then removed and specimens are collected. Following this an intravenous 'phthalein test is given and the urine collected for 10 minutes after its appearance. An x-ray is then taken with catheters in place during the collection of the 'phthalein, and a pyelogram is done if necessary. In this way complete investigation may be done in a very short time, and, except for children with very low renal function, there is seldom any pronounced reaction and the information gained by such procedures far outweigh any complications which may arise, if one is careful in technic and in selecting the patients.

The advantage of such study has been brought out in the last few years in a number of cases, several of which are particularly interesting.

One, a young girl, six years of age, who had shown a pyuria since 2½, was subject to recurrent attacks of pyelitis on the right side. She came under my care about a year and a half ago in a very weakened condition, being quite toxic, looking pasty, running a low fever and having a dirty urine with colon bacillus

infection. The 'phthalein was about 2/3 reduced, blood nitrogen about 80. This child had been treated by pediatricians and internists, by internal medication and health resorts. The mother was advised that such conditions usually rectified themselves, and to let the child outgrow it.

This "out-grow it" seems historic and I imagine many have been planted before the outgrowth developed. You, as scientific pediatricians, have fortunately "out-grown it" now.

She was found to have a marked contracture of the vesical neck with 10 ounces of residual urine, regurgitation up both ureters, very large dilated ureters and moderate dilatation of the renal pelves on both sides, more pronounced on the right. The right kidney showed less function than the left. The contracture at the vesical neck was removed about a year and a half ago by suprapubic excision. She quite promptly emptied her bladder, her general health improved markedly and she continues well.

Another patient, a boy, 9 years of age, who had been treated for enuresis for a number of years, was wearing a rubber urinal, the enuresis being a paradoxical incontinence from an overdistended bladder. The child was operated upon several years before this time for spina bifida and this was then believed to be the sole cause of the incontinence. He was extremely uremic. The blood nitrogen was 100 and over, and there was practically no trace of 'phthalein. He also had had marked chills and fever and was treated with urinary antiseptics for a double recurrent pyelitis for two years. He was put in the hospital, catheter inserted, his bladder decompressed, was given the supportive and eliminative regime that is familiar to you all. In the course of time he improved sufficiently to allow investigation. The cause of his trouble was found to be a marked contracture of the vesical neck plus a relaxed urethra secondary to his spina bifida. Plain x-ray plates were negative for renal calculi but showed an elongated shadow about an inch by three-quarters in the true pelvis to the right which was taken by roentgenologists to be a stone in the bladder. This was also believed to be one of the causes of his urinary complaint. This, however, proved to be a part of the sacrum which had been distorted from his malformation and surgical manipulation. It was extra-ureteral, extra vesical and definitely bony. Cystogram showed a very large bladder, marked regurgitation up both ureters with extreme dilatation up both ureters and renal pelves. In spite of his nerve defect I did a suprapubic and removed a dense contracture from his internal orifice. Following it the child immediately made a very nice recovery with little reaction and in the course of a short time emptied his bladder completely. He was troubled with slight incontinence of urine due to his neurological defect, although it was nothing to compare with the incontinence of the paradoxical type which he had had before. His general health improved wonderfully, he gained weight, went to school and looked quite well. His renal function was always extremely low, even after a year of freedom from obstruction. His kidneys had been almost completely destroyed by this long delay in investigation. This child died this spring from an acute nephritis with suppression following exposure to cold after falling overboard.

Both of these children could have been spared a great deal of kidney substance had they not been treated for pyelitis by internal medicine for such long periods. These are the causes in which urological investigation offers its greatest aid to pediatrics.

Another child who had suffered with recurrent attacks of bilateral pyelitis was 5 years of age. He had been treated for this infection with alkalis alternating with urotropin and acid sodium phosphate without the slightest relief, and was found to have a congenital stricture at the intramural portion of both ureters. A suprapubic was done with transposition of the ureteral orifice, an operation which I described several years ago; that is, opening of the vesical mucosa, removing the strictured area and moving the opening of the ureter outward near its entrance into the bladder wall. The results from this operation are much better than from a transplantation and it is not so serious for the patient.

The recurrent unilateral infections may come from obstruction of one of the two ends of the ureter, or may be entirely renal, and ureter catheter drainage and lavage and ureteral dilatation will cure many and spare them from surgery. The majority of these who have come under our observation have had completely destroyed kidneys from large pyonephroses and have required nephrectomy. They have all recovered and with one or two exceptions have been operated upon in two-stage. Here again is a very important urological suggestion: in the acute pyonephroses in children who are extremely ill the removal of a large pyonephrotic kidney in one stage would result in an extremely high mortality rate. For this reason a preliminary drainage operation, which can be done quickly and with little disturbance, is very important. This allows the child to recover from sepsis without opening more lymphatic spaces for absorption. It, furthermore, allows the kidney to shrink and offers a very easy second operation rather than a difficult first provided it is done in a reasonable time, say within three weeks. It also allows a restoration of function of the normal kidney which is so frequently subject to a toxic nephritis. This two-stage method cannot be too highly recommended in the pronounced infections in children.

Perinephritic abscess is quite common, usually results from cortical abscess and is dealt with in a similar manner to that of adults. Another important feature in the urinary infections in children is that inflammation of the bladder which is commonly diagnosed is rarely found. I do not recollect ever having seen an inflammation of the bladder without some coincident infection either above or adjoining the bladder or some obstructive lesion or foreign body. Furthermore, the chills and fever common in infections in the urinary tract should not result from

a cystitis, owing to the disposition of the lymphatic supply.

RENAL CALCULUS

Renal calculi are frequently found in infants and children and often are productive of typical colics, very often misunderstood and treated for some abdominal condition. A urinalysis will usually lend great aid in the differential diagnosis. X-ray is of frequent service, but occasionally fails to show calculi since uric acid stones are frequent in children and are often undetectable by radiologic studies unless these are associated with urography. Thomas and Tanner in 1922, collected 203 cases of calculi in children under 15 years of age, the average being 7.8 and 112 cases were found by x-ray.

Among other kidney and ureteral conditions in children which are a very frequent cause of infant mortality is hydronephrosis. This is a precursor, of course, of conditions which have been spoken of before, that is infections, and in the analysis of Bugbee it was shown to be the most common cause of death. Only one-half of the cases lived to be six months. The presence of an upper abdominal tumor in a poorly nourished child, regardless of urinary findings, or radiological studies, should make one suspect this condition. An early investigation is necessary. Even in infants it is not difficult to make a thorough study, and if such lesions can be found and treated early before destruction of the renal parenchyma we may hope for a definite lowering in the infant mortality rate.

Kidney tumors are quite common in children and are very serious. Hematuria in a child should immediately make one think of tumor, although in children hematuria is not so frequently a cardinal symptom as the appearance of the growth. There are other conditions which may produce it which are far less serious, such as calculi, tuberculosis, and urethral conditions. Hematuria resulting from urethral engorgement in young boys is not uncommon. I have seen a number of such bleedings result from masturbation which entirely stopped after the child was made to realize the seriousness of the excess, in some instances following applications of silver to the deep urethra and light massage of the prostate. Early removal and irradiation offer the only chance for the kidney tumors. In our series of 15 tumors there have been five embryomas, the remainder sarcomas and hypernephromas. Anomalies such as horseshoe kidney, fused kidney, polycystic kidney and ectopic kidney are found quite frequently and their therapeutic handling is entirely dependent upon pathological processes which are present.

Bed-wetting, the bugbear of all pediatricians, is a very trying condition. If the bed-wetting is unassociated with diurnal urinary complaint it is seldom due to any serious pathological urinary condition, but regardless of pathological association it still requires the utmost patience on the part of the doctor, child and family. I have no remedies to suggest as you have probably used them all. I would, however, bring to your attention the importance of light massage to the bladder neck through the rectum of both male and female child and occasionally in the older child the instillation of mild silver nitrate. Calisthenics to the muscles of the bladder neck by way of starting and stopping the urine frequently during each act is of utmost importance. I have seen a number of children who have been bed-wetters up to the age of 14 respond to this type of treatment. It has been quite striking to me that in the numerous cases of bed-wetters who have been rebellious to treatment, a great many have shown spina bifida occulta.

Tuberculosis of the kidney in children is not by any means rare, and it is quite surprising how advanced the tuberculous process may be even in very young children.

One of the most advanced cases of tuberculosis I have ever seen occurred in a child of thirteen who had a history of bladder distress for a number of years with periodic attacks of frequency and burning with occasional blood stained urine. She resisted all sorts of medication and about two years before I saw her developed a flexion and internal rotation of the left hip, which was thought to be the result of tuberculosis of the hip joint. I found that this child had a very marked caseating calcified tuberculosis of the left kidney and ureter, the whole tract being visible by x-ray without injection. The hip condition was due to a marked infiltration and embedding of this tuberculous ureter into the psoas muscle. Nephro-ureterectomy completely cured this child not only of her bladder condition, but also of her hip complaint.

The presence of pus and red blood cells in the urine of a child who is suffering from bladder irritability particularly if not associated with pyogenic organisms should make one suspicious of renal tuberculosis. The treatment so far as we know today is always surgical if the process is unilateral.

Vesical calculi and foreign bodies are occasionally seen in children and seldom occur under ten years of age, at which time they are sufficiently developed to allow not only cystoscopic study but usually the removal of either the foreign body or stone by the trans-urethral method. Just yesterday a urological friend of mine told

me he had removed a hair pin from the bladder of a girl ten years old by means of an operating cystoscope. The trans-urethral method is far superior to open section wherever it is possible.

I will not take your time discussing the various perceptible congenital anomalies in children such as extrophy hypospadias and epispadias, as you are thoroughly familiar with them, and besides, I have little to offer you. I shall briefly mention two such conditions suggesting in one "noli me tangere" and the other "semper me tangere." First, balanic hypospadias, that is where the opening is in the location of the glans penis. Many such cases have been operated upon by plastic methods, most frequently by the Beck operation, but my experience has convinced me that they are not satisfactory and that the original is usually better than the reconstructed, and since this rather slight hypospadias will interfere so little with the act of urination, copulation and impregnation, I see no excuse for surgical intervention.

The one congenital anomaly which offers the best plastic result is the undescended testicle. This condition occurs quite frequently. Many of these descend to their normal resting place during the first year and should cause no undue concern at this time. A few come down from the first to the sixth year. After this the chance of descent is very slight and surgery will become necessary. About one in every 500 boys have undescended testicles. All of the testicles so retained lose their spermatogenic function but many, even in double cryptorchids, retain the cells of internal secretion. Such testicles are always smaller and atrophic. Since Bevan introduced his operation for undescended testicle, which consists in the correction of hernia and separating of the sac from the cord, which is almost 100 per cent present in undescended testicle, and the severance of the anterior vessels which he supposed were the positive agents in the shortening, leaving only the blood supply of the vas to maintain the nourishment of the testicle, it has been definitely shown that such testicles can in the majority of instances be brought completely down to a normal position in the scrotum. This operation gained popularity, but it was soon found that such organs did not develop, indeed they often suffered a more pronounced atrophy. It has now been definitely proven that the vessels of the vas are not sufficient to maintain the nutrition of the testicle. During the army period when, at the first draft, it was necessary to have such defects repaired, I had occasion to do a number of undescended testicle operations and it occurred to me that owing to the elasticity and tortuosity of the veins they should not be responsible for the shortening, and I immediately realized that the fascia surrounding the cord were responsible. For this reason I completely removed the fascias from the cord as it entered the internal ring by holding the testicle upward on tension and rotating it with the internal ring as the central point. Without cutting the main veins of the pampiniform plexus, I found it was quite easy in most instances to bring the testicle to the bottom of the scrotum. About this time Keyes of New York proposed a method of removing the fascia from the whole length of the cord. This makes the operation a little more extensive and injury to the vessels is much more likely, but in some instances it is essential to strip the cord of its membranes. However, the majority can be put into the scrotum by simply cutting the fascia at the internal ring. It is always essential to have the testicle at the bottom of the scrotum without compromise and indeed in most instances it should be a little lower before it is placed into the scrotum, and it usually can be. This operation requires time and patience, but by exercising these almost every undescended testicle can be put in its proper place and made to stay there. There is seldom an excuse for orchidectomy or the replacement of the testicle into the abdomen. I have done about 40 such operations with the most gratifying results. It has been claimed that the placing of the testicle in the scrotum will not insure its spermatogenic capabilities. This I doubt. In checking up cases which I have done, I have noticed that the great majority have shown normal testicular growth if they were operated upon at an early period in life. I have had no chance to check the spermatogenic function, as I have had but three double cryptorchids and they are still too young to offer proof.

CONCLUSIONS

(1) The great frequency of urological diseases in children makes accurate investigation extremely important.

(2) It has been repeatedly proven that such investigations can be very satisfactorily carried out with little hazard and with very gratifying results. Infant mortality may be definitely reduced and the health of a large number of children markedly improved and destructive lesions in the kidneys which may require removal later in life may be obviated.

(3) The comparative frequency of the undescended testicle and the deleterious effects upon it from its malposition makes surgical treatment necessary in most instances, such

treatments being accompanied by very gratifying results.

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DISCUSSION (Abstract)

Dr. McKim Marriott, St. Louis, Mo.—Genito-urinary conditions are of frequent occurrence during childhood and in a certain number of instances it is impossible to make an accurate diagnosis or to institute the proper treatment without the aid of the urologist.

We must differentiate between pyelitis which is a symptom and pyelitis which is a disease. Acute pyelitis occurs so frequently as a concomitant of nose and throat infections, dysentery, malnutrition and various infectious diseases that it may be considered almost in the nature of a symptom. In such cases the most effective treatment of pyelitis is treatment of the underlying condition. Chronic pyelitis, however, is more serious and is frequently due to anatomical conditions in the genito-urinary tract. Cystoscopy, pyelography and ureteral catheterization may be necessary to determine the cause or to aid in treatment. It is in these cases that the services of the urologist are most needed.

It is to be borne in mind that pyelitis with marked symptoms may occur when there is no pus in the urine, the symptoms being due to retention of pus. In such cases ureteral catheterization occasionally results in the discharge of pus in the urine and the amelioration of the symptoms.

In any case in which an enlarged kidney can be palpated there should be consultation with the urologist. The enlargement of the kidney may be due to congenital anomalies or to pyonephrosis or to tumor. Early and accurate diagnosis in such cases may lead to the saving of the child's life.

Dr. Geo. R. Livermore, Memphis, Tenn.—Cystoscopy in children is a perfectly safe procedure except when the blood urea and creatinin are high. It can be done with the same ease and precision as in the adult, and usually with less reaction. It is not right to treat a child with pus in the urine for pyelitis with alkalies for months, when an accurate and correct diagnosis can be made in practically 100 per cent of cases by cystoscopy and x-ray.

Dr. Clinton K. Smith, Kansas City, Mo.—Most of the discussion on urology in children centers about pyelitis. While many of these children make a satisfactory recovery on expectant treatment, still—there is a class of cases in which the condition becomes chronic, due to urinary stasis in the upper tract. These should be given the same opportunity for recovery as adults, with the aid of ureteral dilatation, etc. It is indeed gratifying to observe how quickly these youngsters, who have often been dragging on for months, with fever and malnutrition, recover with proper instrumental assistance.

There is just one other point which I wish to mention, and that is, in these cases of enuresis and diuresis, every possible source of local irritation should be eliminated. In one such case a little girl of eleven years, had never slept in a dry bed and had never passed a day with dry clothes. We carefully investigated the entire urinary tract, by cystoscopy, ureteropyelography, etc., without any results. Finally, as a last resort, under gas anesthesia, a thorough dilatation of the rectal sphincter was done, followed by immediate bladder control.

TREATMENT OF GONORRHEA IN WOMEN*

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The history of gonorrhea extends into early times and is well known to all. The idea of its infectious nature goes back to the Old Testament. In Leviticus XV, we are told:

"And the Lord spake unto Moses and to Aaron, saying: Speak unto the children of Israel, and say unto them, when any man hath a running of his flesh, because of his issue he is unclean.

"Every bed whereon he lieth that hath the issue is unclean; and everything whereon he lieth that hath the issue is unclean; and everything whereon he sitteth shall be unclean. And whosoever toucheth his bed shall wash his clothes and bathe himself in water, and be unclean until the even . . . . And what saddle soever he rideth upon that hath the issue shall be unclean . . . . And the vessel of earth that he toucheth that hath the issue shall be broken . . . . and the woman also with whom man shall lie with seed of copulation, they shall both bathe themselves in water and be unclean until even."

The ancient Hebrews made many wise laws but were over optimistic about the duration of gonorrhea, since they considered a twenty-four hour period sufficient to complete the course of the disease.

The salient modern work upon gonorrhea was done by the Scotchman, William Hunter, who contributed many keen observations but failed to distinguish between gonorrhea and syphilis. This distinction was first made later on by Ricord, of Baltimore. Neisser, in 1879, isolated the causative organism, and Bumm six years afterward grew it in pure culture.

The disease is often looked upon lightly, and the average patient is half treated by the physician or sent away with a prescription and a douche. Although gonorrhea is sometimes spoken of as a self-limited disease, its complications are legion. In the latter part of pregnancy or in the postpartum stages, when the husband may be tempted to seek extra-marital sexual congress, it often occurs unexpectedly. There is not only the danger to the child, but increased danger of ascending infection after delivery, fatal peritonitis, or pelvic inflammatory disease and consequent sterility.

The diagnosis and the termination of cure of gonorrhea in men and women offer entirely different problems. A discharge from the male urethra is abnormal and at once arouses sus-

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picion. In the female, a leucorrhea of some sort, is almost the rule in married women, in some single women and in particularly all those who are rendered liable to infection.

In case of any bladder irritation or unusual or irritating discharge, examination should be made for gonorrhea. In pregnancy when the bladder is usually irritable and leucorrheal discharge is common, the infection may be frequently overlooked. The disease may be diagnosed clinically but the diagnosis should not be considered final until the intracellular gram-negative diplococcus is found in a stained smear. A common mistake is to submit vaginal smears for examination, which are confusing. Perhaps a better means of making a diagnosis, but one not in common use in the South, is that of culturing the gonococcus. The routine culture test requires laboratory facilities superior to those usually available.

One negative smear means little in diagnosis. Several negatives, at intervals of days during which the patient is not undergoing any treatment, are necessary. The criterion of cure is similarly difficult, and three negative smears are usually required before the patient is pronounced well, though more are advisable. In exceptional cases, the writer has observed six negative smears on different days, and a seventh clearly positive in the same case. In case of doubt, it is better to treat too much than too little.

The best opportunity which the writer has had for the intensive study of gonorrhea was immediately following the World War, in 1920 and 1921, when the City and County Health departments of Birmingham, Alabama, and Jefferson County, conducted the Detention Hospital where venereally infected women were legally detained on charges of vagrancy and treated until they were considered non-infectious.

Many varieties of conditions were encountered. The patients who were released were clinically cured and had had from three to eight negative smears, except a few who for various reasons escaped or were released before treatment was complete.

More than a third of the cases had complicating syphilis; a number had chancroids; there were goiters, pulmonary tuberculosis, morphin habitues, focal infections, ureteral strictures, pregnancies and abortions, infected tubes, infected Bartholin's glands, infected Skene's glands, varieties of cervical lacerations and eversions, condylomata, venereal warts and abscesses. Gonorrhea and chancroids were treated to a clinical cure, and syphilis was treated until non-infectious. The average time used in treating gonorrhea was about eight weeks.

The frequent extreme virulence of some of the infections, complications, and probably reinfections from unnatural practices upon themselves and others, were unfavorable factors in the treatment. The women in many instances must have been subjected to Neisserian infection from many different contacts, so that no one strain was responsible but a polyvalence of strains.

Unusual favorable factors to the treatment were the detention and forced rest, with regular hours of eating and sleeping for these women who were unaccustomed to such a life; their extreme youth, many of them being fifteen to seventeen years old; and the carefully enforced treatment by a very capable nurse in charge. A great difficulty with the office patient is her failure to follow out instructions, and her frequent tendency to give up treatment before she is cured.

There are as many different methods of handling female gonorrhea patients as there are gynecological writers, and the last word has not been said regarding treatment. The common antiseptics used are organic and inorganic silver preparations, iodin, acriflavine, mercurochrome, potassium permanganate, picric acid, etc. Several germicidal agents should be used alternately, to lessen the possibility of the development of a tolerance for any one drug. The surgeon must, of course, be prepared to remove with a knife, all inaccessible and intractable foci, but patient study of the case will often render this unnecessary.

Wherever possible in the acute stage, the patient is put to bed for a week or ten days. The rest tends to limit the spread of the infection and affords leisure for establishing the routine of home treatment. Forced fluids aid in the elimination of toxins, are useful in cystitis, and help remove pus, thus alleviating symptoms. Bladder irrigations serve the same purpose, but are given only when there is pus in the urine. Bladder and urethral instillations are continued as long as the cervix is treated and vice versa to avoid reinfection of one by the other. Douches mechanically remove the discharge and the organisms that lie in the vagina. They lessen absorption of toxins and have a tendency to lessen reinfection.

Although douches are right under the ban during pregnancy, low douches in gonorrhea do much more good than harm. No antiseptic should be injected into the cervix and cotton applicators should be employed only with the greatest care and gentleness.

The writer's routine recommended treatment in non-pregnant cases is as follows:

(1) All acute cases are preferably put to bed for seven to ten days.

(2) *Physician's Treatments:* (a) For a week or ten days daily, and then every other day throughout the course of treatment, the cervical canal is swabbed with a cotton applicator dipped in one of the following: 10 per cent argyrol, 2 per cent silver nitrate, 1 per cent acriflavine, and 2 per cent mercurochrome.

(b) On the same occasions 10 per cent argyrol or 1/2000 acriflavine is instilled into the bladder. Should the urine contain pus, the instillation is preceded by irrigation with normal saline solution.

(3) *Patient's Treatment*: (a) One dram of 10 per cent argyrol is injected into the vagina by means of a glass McElroy male urethral syringe while the patient is lying upon her back in bed. A thick guard is applied and the argyrol is retained all night if convenient.

(b) An alkaline cleansing douche is taken next morning.

(c) Argyrol is instilled into the vagina after breakfast, retained for one hour, and douched out.

(d) For an hour after lunch, argyrol is kept in the vagina and then removed by a douche.

(e) At bedtime argyrol is placed in the vagina for the night, etc.

(f) The patient is requested to occupy a bed by herself and under no conditions to engage in coitus till pronounced well.

(g) As is desirable in all infections, fluids are forced.

Of late, stubborn cases in non-pregnant women, and particularly those with a history of having wandered from physician to physician, have been treated with a few drops of 10 per cent mercurochrome carefully instilled into the cervical canal by means of a curved pipette to which has been attached a medicine dropper bulb. The results have been surprisingly good. As an illustration the following case report is offered:

Case Report.—Mrs. M., a divorcee of 26, and a telegrapher by occupation, came on February 25, 1925, complaining of gonorrhea. Her history was that she had contracted gonorrhea from a dissipated husband in November, 1923, nearly three years previously. Although she became annoyed by increased frequency of urination and a vaginal discharge, she attributed it only to leucorrhea and consulted various physicians in small communities where she was employed, and gonorrhea was not diagnosed until August, 1924. Her physician then put her on saline douches and gave her topical treatments of some kind twice a week for six weeks. Then he instituted some sort of electrical treatments until February, 1925, at which time she moved to Birmingham and I first saw her.

Examination revealed a lacerated cervix with an eversion of the cervical mucous membrane, a profuse milky leucorrhea on the vulva and in the vagina and some tenacious white discharge from the os. Nothing could be expressed from Bartholin's glands or from the urethra, but routine cervical and urethral smears showed the gonococcus.

The above described treatment was used, but the patient's occupation made her visits very irregular and infrequent. Usually only one or two treatments a week were taken and she was unable to carry out the home treatment *in toto*.

Five months of this showed her no nearer a clinical cure than at first. Then 10 per cent mercurochrome solution was used in a dropper in the cervix; and the urethra and bladder treatment was continued with 10 per cent argyrol, or 1 to 2000 acriflavine solution. A sudden and marked improvement was noted, and in one month's time the profuse leucorrhea had become quite small in amount. Smears were begun and were found negative at each examination.

The surprisingly quick benefit to be derived from 10 per cent mercurochrome is in such marked contrast to the use of the 2 per cent solution that it is like using a new drug. Various other instances of successful use of it in stubborn cases could be recounted.

CONCLUSIONS

Gonorrhea is a disease of antiquity which since antiquity has been by different methods inadequately treated. Its diagnosis is frequently overlooked because smears are not made and examined for the gonococcus or because the smears sent to the laboratory are improperly made.

A rather satisfactory routine method for the treatment of gonorrhea in women has been described. For the rare chronic cases in which this fails, a more radical treatment is offered. Treatment without let-up is the key-note in the successful management of gonorrhea in women.

DISCUSSION (Abstract)

Dr. W. B. Anderson, Nashville, Tenn.—As obstetricians gonorrhea interests us most in infection of the birth canal at the time of delivery. Where I am suspicious of infection, besides the usual preparation for delivery, such as shaving the vulva, giving a vulva and hip bath with lysol solution, etc., I swab the vagina and vulva with a 2 per cent mercurochrome solution. I use a fresh 20 per cent solution of orgyrol to protect the eyes instead of a 1 or 2 per cent solution of silver nitrate. It is generally conceded that 20 per cent argyrol is just as prophylactic as silver nitrate, and not so irritating to the eyes. And if we bear in mind that the baby's face and hands are exposed to the same contamination as are the eyes, it is very easy for the eyes to become reinfected from this source, particularly in the hands of a careless nurse. So I mop the face and hands in the same solution of argyrol myself, instead of trusting it to a nurse.

EYE, EAR, NOSE AND THROAT

GASTRO-INTESTINAL DISTURBANCES IN INFANTS AS A RESULT OF STREPTOCOCCUS INFECTION IN THE EARS*

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It is now well recognized that severe intoxications in infants, leading to progressive vomiting and diarrhea with dehydration and cachexia are due for the most part not to food poisoning, but to a toxemia of infectious origin. Autopsies on these cases have uniformly failed to show pathology in the gastro-enteric tract while almost without exception they have shown lesions elsewhere in the body which were usually of streptococcus origin. It is also a well known fact that these cases all have fever and leucocytosis which are difficult to explain on any basis other than infection.

In reviewing the histories of fifty-eight of the cases of athrepsia and anhydremia occurring at the Children's Hospital in the last two years, it was found that all but two showed a definite infection outside the intestinal tract. The most common infection was otitis media which was present in fifty-one cases or 87.7 per cent. Pneumonia occurred in eighteen cases or 32.2 per cent. Other infections which were present in a smaller number of cases were, measles, pyelitis, furunculosis, chicken-pox and congenital syphilis. Of these fifty-eight cases, 38 or 61 per cent died. That 87.7 per cent of these babies with gastro-intestinal symptoms leading to extreme dehydration and cachexia had a frank purulent discharge from one or both ears is a very significant fact.

The co-existence in the same baby of severe gastro-intestinal disturbance and otitis media has been noted for many years by both pediatricians and otologists. The first, however, to suggest a causal relationship between the two was Hartmann[1] who, in 1898, mentions the fact that digestive disturbances, diarrhea and progressive loss of weight in infants, may be brought about by infection in the ears. He also found that drainage of these infected ears by paracentesis favorably affected the gastro-intestinal syndrome and suggested that all infants with intestinal disease and progressive loss of weight should have the ears carefully examined for possible otitis media. Preysing[2] in 1904, stated that he believed that the severe intestinal disturbance in such cases was due to toxic substances which had found their way into the blood or lymph currents owing to rapid absorption from the middle ear empyema. In 1921, Maurice Renaud[3] made the following statement:

"During the months of August and September, 1921, the middle ear and mastoid antra were examined in seventy consecutive autopsies on infants that had died from athrepsia and infantile diarrhea. In all of them extensive suppuration in the middle ear and mastoid ontra was found. Thirty cases had been diagnosed as otitis media during life. The forty others had been overlooked. The final diagnosis in most of the cases was infantile diarrhea.

"The clinical course of all of these infants was that of progressive athrepsia with vomiting, diarrhea, final cachexia and death.

"The pathological findings in these cases, as far as the digestive tract went, were generally negative except in certain cases for hyperplasia of the lymphoid tissue. Pus infection of the middle ear and mastoid antra was found in all the cases. In four-fifths of the cases the lesions were bilateral. The ear drums were usually thickened and red, though in many cases they appeared normal. There was, in some cases not only inflammation of the mucous membrane, but a true osteomyelitis of the petrous portion of the temporal bone. The internal ear showed infection in a small number of the cases.

"As a result of these postmortem examinations and in an attempt to save some of the babies, post-auricular drainage was done in ten cases of athrepsia *in extremis*. Nine died. One made a splendid recovery. The high percentage of mortality was attributed to the fact that the operation was done too late and when the baby was in a desperate condition. After this treatment the ears of all these patients showed at least temporary improvement."

His conclusions were as follows:

"Nurslings become cachectic because they are suffering from infection, not because of heredity or dyspepsia.

"Ears must always be examined, and antrotomy done if there is no improvement after a few days of conservative treatment. The diet question becomes secondary to the presence of infection."

That children often show marked constitutional disturbances, usually of the gastro-intestinal type, which are the result of infection in the mastoid, without the usual symptoms of mastoiditis, is well known. McDougal and Knauer,[4] in 1923, reported five cases of mastoiditis in children, in which the principal symptoms were extreme prostration, progressive emaciation and lethargy without any of the classic signs of mastoid infection being present. Of these children, three died and autopsies demonstrated extensive pathology in the middle ear and mastoid, which was due in each case to the streptococcus. The two children who lived

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were those in which early bilateral drainage of the mastoid was done.

Byfield[5] also calls attention to gastro-intestinal symptoms in children which are the direct result of obscure infection in the middle ear or mastoid. Floyd[6] reports a series of twenty-six babies with mastoid infection which came under his observation. The most marked symptoms were severe and sudden gastro-intestinal disturbance, rapid dehydration with pronounced loss in weight, extreme toxicity and, in a few of them, death within a short time from the onset of the disease.

His conclusion is as follows:

"Bilateral mastoidectomy performed as soon as the condition is determined and other foci eliminated has resulted in prompt recovery of many of these infants and is probably the only means of saving the child's life."

Marriott[7] summarizes the pediatric aspect of the syndrome in the following statement:

"That the symptoms of these children, especially the hydrolability or gastro-intestinal symptoms, are the result of a specific intoxication rather than of fever in itself seems probable. Infants suffering from other types of infection with higher temperatures do not exhibit the same symptomatology. Even infants with mastoid infections due to other organisms such as the pneumococcus or staphylococcus do not exhibit these symptoms.

"It seems probable that the symptoms are the result of a streptococcus toxin and that this toxin acts by damaging the capillaries. The toxins of other streptococci, such as the scarlet fever streptococcus, act on the capillaries of the skin and of the renal glomeruli. In infants the gastro-intestinal tract is the seat of much greater activity than in older children and it seems that the toxin affects the capillaries more in this portion of the body than elsewhere. The capillaries of the skin surface are definitely constricted in these infants and abnormal in shape. Laying aside the theory of the possible mechanism of these infections in bringing about the symptoms, the fact remains that such infections are constantly associated with the condition under discussion and that the most hopeful method we have yet found consists in dealing promptly with the infections."

With these facts in mind, about a year ago we began making repeated and careful examinations of the ears of all the babies with athrepsia and anhydremia at the St. Louis Children's Hospital. For this purpose an electric otoscope with brilliant illumination and some magnification was used. We soon found that with this instrument we were able to see certain signs of middle ear disease which with the head mirror and reflected light we had previously overlooked. Occasionally the ears of these infants showed the conventional signs of acute suppuration, though in the majority of cases redness and bulging of the drums were not present.

However, there was almost always a distinct change in the color of the drum, the normal lustre having given place to a dirty grey opaque appearance. The one finding that was most constantly present in this condition was a distinct sag of the superior or posterior superior canal wall just external to the tympanic membrane.

In infants, there are two anatomical factors which help to make this particular symptom of more than ordinary significance. At birth, the antrum, attic and upper portion of the middle ear are filled with soft mesodermal tissue, which as the child grows, becomes gradually absorbed and thinned out. But in early child life there is so much of this embryonic mucosa remaining in the attic and antrum that it requires only the slightest irritation in this region to cause swelling enough entirely to separate these cavities from the middle ear. This is the reason why suppuration in an infant's mastoid antrum cannot be adequately drained by the ordinary incision through the tympanic membrane. The second anatomical consideration which has a definite bearing upon this condition is the fact that in infants the tympanic annulus in its superior portion is incomplete. Therefore, any accumulation of fluid in the mastoid antrum will show as a bulge downward of the membranous floor of the antrum or upper wall of the external auditory canal. An incision in order to drain these accumulations must include not only the upper portion of the tympanic membrane, but this membranous floor of the mastoid antrum as well.

In accordance with these last mentioned facts, we changed our method of incising the ear drums so as to include the upper portion of the canal wall as well as the drum itself. This procedure in certain cases gave us much more satisfactory results, though like the ordinary myringotomy incision, it is very difficult to keep open and usually requires daily probing to maintain adequate drainage. That this treatment was efficacious is shown by the fact that most of those cases which recovered without further surgical intervention did so only after repeated incisions of this type and even those which later came to operation or finally succumbed, all showed temporary improvement following incision. However, in many of the babies despite frequent re-incisions of the drum and upper canal wall, the diarrhea, vomiting and general drying out continued until more adequate drainage was established by way of the mastoid.

The decision as to when to drain the mastoid of these babies naturally must rest for the most part upon pediatric rather than otologic considerations. It must be remembered that these cases are at all times medical rather than surg-

ical problems. The diarrhea, vomiting, progressive loss of weight and consequent anhydremia are all factors definitely outside the realm of the otologist. The medical treatment consists for the most part in supportive therapy coupled with replacement of the lost fluids until the hydrolability is corrected. Upon the success of these measures the outcome of the case depends, for unless the weight can be kept up until the infection has been checked and some resistance established, disaster is sure to follow. So we have found that the weight curve of these babies is one of the safest criteria as to the progress of the case. When in the presence of a proven streptococcus infection by draining the ears through the canals we are able to check the loss in weight or when even in spite of continued fever the child is gaining weight, we feel that he has a good chance for recovery. However, when in spite of all medical treatment and repeated incisions in the drums and upper canal walls, the weight curve is still rapidly going down, we believe that mastoid antrotomy is indicated.

The surgical drainage of infected mastoid antra in infants is not a formidable procedure. In all of our cases except one, it has been carried out under local anesthesia. For this purpose 0.5 per cent novocain with eight drops of adrenalin to the ounce is used. The skin along the line of incision and the periosteum over the upper portion of the mastoid is thoroughly infiltrated. The incision required is usually about 2 cm. in length. After the periosteum behind and above the superior bony wall of the external auditory canal has been elevated, a round button of bone is taken out with two strokes of an 8 mm. Alexander gouge. This completely uncovers the posterior end of the mastoid antrum. In infants, this consists usually of a single cell varying in size from 6 to 10 mm. in diameter. Careful curettage of all granulations from this cell is done without any attempt to pass the curette into the attic. In other words, the mucous membrane of the *aditus ad antrum* is left undisturbed. A small drain is placed in the cell and no attempt at surgical closure of the incision made.

The postoperative care of these cases consists in changing the drain and wiping out the mastoid cavity with a solution of mercurochrome until the middle ear has become entirely dry. The drain is then withdrawn and the wound allowed to close, which it does very rapidly.

Up-to-date, we have operated upon seventeen babies with this syndrome. These children were between two and fourteen months old, the majority between three and seven months. Of this group, nine recovered and eight died. The average of the ages of the children that recovered was 8 3/8 months, that of the fatalities 3 5/7 months. From this it would appear that the older the child the better the chance for recovery. None of the deaths could be attributed to the operation or to postoperative shock, despite the fact that several of the babies were *in extremis* when operated upon. Even those that finally succumbed showed distinct temporary improvement following operation.

Cultures taken at the time of operation showed hemolytic streptococcus in thirteen of the cases, pneumococcus in one and three of the cultures were lost or contaminated so that a report was not available.

In eleven of our cases both ears were involved, while six showed pathology on one side only.

In the light of our present knowledge of this condition we feel that several of the fatalities, especially in the early part of our work, could perhaps have been avoided had they been operated upon as soon as the diagnosis was established instead of temporizing with the use of more conservative measures.

CONCLUSIONS

(1) Athrepsia and anhydremia in infants is the result of streptococcus infection.

(2) The most common sight of infection in these cases as shown by hospital records and autopsy protocols is the ears.

(3) The ears of all infants suffering from progressive diarrhea and vomiting leading to anhydremia should be repeatedly examined with the electric otoscope and the drums and upper canal walls widely opened if they show any evidence of infection.

(4) When despite adequate medical treatment and repeated incisions in the ear drums and superior canal walls, the weight curve continues to drop, the ears should be drained through the mastoids.

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TROPICAL DISEASES AND PUBLIC HEALTH
SYMPOSIUM ON MALARIA

SOME FEATURES OF MALARIA CONTROL*

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In the light of our present knowledge, we are forced to the conclusion that we cannot hope to eradicate malaria in the near future from most infected districts. To do so would necessitate either the destruction of all malaria-transmitting mosquitoes in low-lying areas throughout the world between the latitudes of 40° south and 60° north (a task impossible of fulfillment), or else the discovery of a plasmodical agent capable of destroying the parasites in the host in all stages of their development.

It is a fact that in many districts, in this and other countries, malaria has been practically eradicated. The contributing factors in this accomplishment have been, first, the drainage and cultivation of the soil, involving destruction of a large proportion of the mosquito-breeding places and reduction of the Anopheles index to such a degree that the possibility of transmission was minimized; second, our increasing knowledge of the various problems connected with the prevention and cure of malaria, and the utilization of that knowledge by most of the inhabitants of the districts.

Our hope for the future lies in the general adoption of these measures. Therefore, to this end there should be compulsory education, which should embrace a knowledge and application of the general principles of sanitation and of the methods of malaria prevention. In the meantime, all that we can expect in most malaria-infected districts is the intelligent application of recognized and reasonable measures of control.

PREVENTION AND CURE

A discussion of the problems concerned in the control of malaria must consider the disease from two standpoints, namely, prevention and cure. In the present state of our knowledge, there is but one known method of preventing infection by malaria, and that is to avoid being bitten by a malaria-infected mosquito. Consequently, either mosquitoes which transmit malaria must be destroyed in some of their life phases, or we must protect ourselves against being bitten by them. As to the first proposition, this, unfortunately, is practicable or possible only in some few limited localities. Because of the breeding habits of Anopheles mosquitoes the destruction of their larvae becomes a problem of the greatest magnitude, and in many districts the expense involved in such a method could be justified only under extraordinary conditions. As to the second proposition, (protection against the bite), this can be accomplished only by living in effectively screened houses or through the proper use of "bed nets."

The flight of the Anopheles mosquitoes in search of warm blood begins about sunset, and most of them feed before nine o'clock. However, they will sometimes continue to feed until sunrise. During this period, a person must have complete protection against the bite of the Anopheles. Both screened houses and "bed nets" are absolutely useless unless advantage is taken of their protection during the entire period between sunset and sunrise. We know that a great many individuals who live in screened houses contract malaria. The fault lies not in the screening, if this has been effectively done, but with the individual in not seeking protection during the hours when the mosquitoes are actually searching for food. Naturally, "bed nets" are not so effective as screened houses, for the reason that people do not, as a rule, take advantage of their protection until late in the evening, after the majority of the mosquitoes have fed. In this connection, in malaria-infected districts, emphasis should be laid on the necessity of screening all buildings utilized at night for business purposes or for public gatherings. If these buildings are left unscreened, they are fruitful places for malaria infection. Another important precaution is to prohibit public gatherings in the open after sunset.

QUININ PROPHYLAXIS

Formerly it was thought that quinin in proper dosage would effectually prevent a

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malarial infection, and a great many theories were advanced as to how this drug could be given most advantageously. Some authorities recommended the taking of small doses daily; while others advocated that larger doses, taken once or twice weekly were most effective. Recently, however, Yorke and Macfie, and others, have demonstrated beyond any question of doubt that no amount of quinin taken before exposure will prevent a malarial infection, either by direct inoculation or infected blood or through the bites of infected mosquitoes. The wastage of quinin, which has been given for prophylactic purposes in the past, has been enormous, and in the light of our present knowledge this practice should be discontinued. The only case in which the administration of quinin for prophylactic purposes is justified is that of a non-immune person who is known to have been exposed to infection. Under such circumstances, quinin may be taken in generous doses for from ten to fourteen days subsequent to the period of exposure. But it is problematical whether it is not better to withhold the administration of quinin until premonitory symptoms develop and parasites are demonstrated in the blood, and then administer quinin in sufficient quantities, and over a sufficient period, to effect a cure. If we begin the administration of quinin with the belief that we have a malarial infection, and the symptoms disappear within two or three days, we are prone to discontinue the quinin before a sufficient amount has been taken to effect a cure, and thus permit our patient to drift into a chronic condition.

In this connection, however, we should state that in infected communities the continuous administration of quinin in modest doses daily or twice weekly will prevent acute exacerbation, thus enabling the infected individuals to continue at work, and avoiding the necessity of hospitalization. This method of procedure will also serve another purpose: by clearing the peripheral blood of parasites we prevent mosquito infection and thus, to a certain degree, control the spread of the disease. This measure is of value in certain emergency labor conditions, but we have demonstrated in our divisions, that such methods do not sterilize the individuals or lower to any degree the percentage of infections, and hence, cannot be considered as a permanent measure of dealing with community infections.

IMMUNITY

It has been definitely proved that many individuals and some races are definitely immune to malaria, and that the degree of immunity which exists in others varies tremendously. The severity of the symptoms and also the facility with which the disease is cured, will depend upon the degree of immunity, or resistance to malarial infection, in each individual. In every malarial district these facts must be taken into consideration, as there is no way of determining the degree of immunity, or resistance, possessed by individuals until infection has actually taken place. In some individuals with high resistance, nothing more than rest in bed, with or without a laxative, is sufficient to clear the parasites from the blood in an acute attack. In such cases, if some drug has been administered, we are prone to attribute the good results to the direct effects of the drug, instead of to the high degree of resistance or partial immunity possessed by the patient.

TREATMENT

The treatment of malarial infections depends upon a variety of circumstances. We know that the severity of the different types of malaria varies. In the order of gravity of symptoms we must place estivo-autumnal, tertian and quartan. In the facility of cure, this order is reversed. Moreover, the asexual forms are eliminated from the peripheral blood much more readily than the gametes.

A consideration of the treatment of malaria necessitates its division into two classes: first, those of primary infections; and second, those of the chronic and relapsing cases. The recent work of scientific investigators has proved beyond the question of doubt that primary infections are readily cured. This work was stimulated largely by Gerstmann, who initiated the method of treating patients suffering from general paralysis, dementia precox, disseminated sclerosis, etc., by infecting them with malaria, either by inoculation or directly through the bites of mosquitoes. Many of these patients had not previously had malaria, so that exact information was obtained as to the period of incubation, individual degrees of resistance, and the amount of quinin necessary to obtain a cure.

From this work it has been fully demonstrated that primary infections are readily cured by quinin if treatment is promptly administered, and the dosage need not necessarily be large. Apparently from 5 to 15 grains,

3 times a day over a period of from 10 to 14 days, was sufficient to effect a cure. In fact, in some of them, where resistance to infection was high, no medication was necessary to free the peripheral blood from parasites. The natural defensive agents of the body were able to take care of the infection. Some malariologists, like Pijper and Russell, believe that most tertian infections are promptly cured in the primary stage by intravenous injections of neo-arsphenamin. This is contrary to the experience of most clinicians in this country, though, undoubtedly, neo-arsphenamin plays an important role in the cure of some chronic cases. We do not believe that there is any known drug as effective as the salts of quinin, in the treatment of acute primary infections, and in the great majority of cases the oral administration of from 10 to 15 grains three times daily over a period of from 10 to 14 days, suffices to bring about a cure. There are some malariologists, too, who believe that even smaller doses are sufficient; but that will depend on the degree of resistance or immunity possessed by the infected individual.

In some individuals, whose resistance is low and in whom no degree of immunity exists, the symptoms are liable to be extremely severe. In these cases, in order to save life, we must resort to the use of quinin either intramuscularly or intravenously in doses of from 7.5 to 15 grains, repeated, if necessary, every four hours until the malignancy of the symptoms disappears. Subsequently, the oral administration of quinin can be carried on until the patient is cured, which, in primary infections, should occur within two weeks. If a temperature continues high more than five days in spite of the proper administration of quinin, some other complicating condition should be suspected.

CHRONIC AND RELAPSING CASES OF MALARIA

The chief difficulties connected with the eradication of malaria rest with these cases. They are reservoirs of gametes, and thus a perennial source of infection for mosquitoes. If we were able to cure our chronic carriers, malaria would soon cease to be a serious problem. In many localities anopheles mosquitoes practically disappear during the dry season, and there is a corresponding lull in the spread of malaria, but with the onset of the rainy season new breeding places are formed, and under such favorable conditions propagation is rapid. The newly-developed mosquitoes in their search for warm blood become infected from these old carriers, or reservoirs, of malarial infection, and are thus able to spread the infection to others.

In the past, insufficient attention has been given to the cure of cases of chronic malaria. Cases become chronic from a variety of reasons, among which may be mentioned, first, that during the treatment of primary infections quinin has not been given over a sufficient period of time or in adequate quantity to effect a cure; and second, that a low degree of resistance on the part of the patient prevents his throwing off the disease. Low resistance on the part of the patient is caused by various conditions, which prevent the natural defensive agents of the body from functioning to their maximum capacity. Among the common conditions which lower the resistance of the patient may be mentioned:

(1) Acute and chronic infections, such as syphilis, tuberculosis, amebiasis, uncinariasis, etc.

(2) Chronic organic or degenerative disease of all kinds.

(3) Focal infections.

(4) Unbalanced and deficient diet, in consequence of which the individual suffers from malnutrition.

CASE REPORT

In order, therefore, to cure chronic malaria in any individual, every effort must be made to diagnose the complicating conditions and give the appropriate treatment, to obtain any progress against the malarial infection. Unless this is done, in many chronic cases, no amount of quinin administered in any way over any period of time will suffice to effect a cure.

An educated white man who had lived in the coast climate of Guatemala for eighteen years, had a case of persistent tertian malaria. He had suffered a great deal from malaria and at intervals had taken large amounts of quinin and arsenic. His recent history was as follows:

In July, 1923, he became quite ill with malaria, a mixed infection, and was given a course of quinin. He took 45 grains daily for 10 days, and 30 grains daily for six weeks subsequently. During the latter part of this period he was in Europe. While there, he stopped taking quinin for about a month and then had another malaria attack, with two definite chills on alternating days, after which he again resumed his quinin. He continued to take 30 grains daily until about the middle of January, in 1924. Meanwhile, in November, he had returned to the tropics, where he lived under excellent sanitary conditions, in a screened house, and was very little exposed to reinfection.

During the early part of March, his tertian-malaria symptoms again returned. For two weeks he took 45 grains daily, then 30 grains daily for eight subsequent weeks, and 10 grains daily for several weeks longer. While still taking 10 grains daily, he fell ill with malaria about July 12, and went back to 45 grains a day for three weeks, subsequently continuing to take

30 grains of quinin daily. This he kept up for three months, when the dosage was reduced to 20 grains daily, which he continued to take until February 1, 1925.

About this time he felt very achy in the limbs, suffered from lassitude and "malaria-like" symptoms, and a thick-film examination of the peripheral blood revealed a tertian gamete. After a consultation with several physicians, he was advised to take 30 grains of quinin daily, 5 m. of Fowlers' solution three times daily, and 0.5 ounce of Warburgs' tincture with aloes, three times daily. This was kept up for fully five weeks, when the Fowlers' solution was discontinued and a weekly injection of arsphenamin given instead. In addition to this, twice a week he took intramuscular injections of 15 grains of quinin, replacing evening doses by mouth.

On Monday, April 13, he was playing golf in the sun, when he had a moderate chill, and went to bed with a temperature of 103° F. He complained of pain in the spleen, which on examination was found to be slightly enlarged. It proved to be a typical tertian paroxysm. The next afternoon his temperature rose to 100.5° F. and the following day to 100° F. With this recurrence on Monday, April 13, all previous treatment was discontinued. A purge was given and he began the use of stovarsol, taking four tablets during the first 24 hours and three daily thereafter, until 25 had been taken.

Two weeks thereafter the patient reported that he felt better than he had "in many moons." His tongue, which had been filthy for over a year, was almost clean, his appetite was better than it had been for months, and the tired feeling in his legs and shoulders had practically disappeared.

On October 9, 1925, the patient reported at my office, after a prolonged vacation in Europe, and stated that he was now feeling better than he had felt in a great many years.

CONCLUSIONS

In the case discussed it will be noted that stovarsol appeared to give the necessary "kick" which quinin, neo-arsphenamin and Fowlers' solution were unable to do, to bring about convalescence. The success obtained by stovarsol in this case naturally led us to try the drug in many others. In some of the chronic cases the results were very satisfactory, but in most of the acute cases, we were compelled to resort to the use of quinin in order to save life. It is interesting to speculate as to why stovarsol, in the case referred to above, was responsible for a result that quinin was unable to effect.

Up to recent times, the belief has been general that quinin was directly plasmodicidal, i.e., that it had a selective destructive action on the malarial parasites. Muehlens and Kirschbaum exposed malarial cultures to solutions of quinin in strengths of from 1 to 2,500 and 1 to 5,000 for variable periods of time, and from these cultures were able to inoculate individuals with malaria. They also similarly investigated the effect of the arsenical preparations upon malaria cultures, with corresponding results. Owing to these investigations, we are forced to conclude that neither quinin, arsenic, nor probably any other known drug, directly destroys malaria parasites. They do so only in conjunction with some agent or agents in the body. Cushny states that when quinin is injected into the blood it leaves the plasma within a few minutes, becoming attached to the corpuscles in some firm combination from which it is difficult to liberate it, and that only about one-third of the quinin administered is eliminated by the kidneys. If quinin forms a direct combination with the hemoglobin of the red blood cells, this may have some inhibitory effect on the growth of the parasites in the cells, or again may render these cells more readily subject to phagocytosis. This, also, would help to explain the difficulty of destroying gametes, as when they are completely developed there is little or no hemoglobin left to enter into combination with quinin.

We must appreciate the fact that every animal survives because of his defensive agencies, which enable him to combat his external as well as his internal enemies (microparasites and macroparasites). After disease germs gain access to our bodies, with the host they enter into a combat, or struggle, for existence, and man survives because of his natural defensive agencies. These are many and elusive. In the case of malaria, probably the macrophages are chiefly concerned, though opsonins and other humoral substances may also directly participate. According to Kolmer, the macrophages consist principally of the larger mononuclear leucocytes; ameboid cells of the spleen and lymphatic glands; alveolar cells of the lung; endothelial cells of the serous cavities and lymph spaces; bone corpuscles and giant cells of bone marrow and embryonic connective tissue cells. It is well known that the large mononuclears are always increased in number in a malarial infection.

The malarial toxin suddenly liberated when sporulation occurs undoubtedly is toxic to cells in the human organism, as shown by the reactionary fever, which is nature's way of stimulating metabolic activity to develop defensive agencies. Some macrophages are destroyed by the toxins, but, in conformity with Weigert's "overproduction theory," overproduction of them immediately takes place to meet the next toxic onslaught. According to Kolmer, sev-

eral compounds are believed to stimulate phagocytosis both *in vitro* and *in vivo*. Among these are calcium, magnesium, mercuric chlorid, quinin, strychnin, and arsenical compounds. It is possible, therefore, that quinin not only acts by stimulating phagocytosis, but that it may also have some direct action in combining with the hemoglobin of the red cells, with which it enters into chemical combination.

We have always felt that in an acute attack of malaria the administration of a preliminary dose of calomel and magnesium sulphate has a beneficial effect. It is quite possible that their action is not confined alone to elimination. They may also have some stimulating action on the defensive agencies. The arsenical preparations, in addition to stimulating leucocytosis, are supposed also to act in stimulating the activity of the bone marrow in the formation of blood cells. In the treatment, therefore, of chronic malaria, it is not wise to depend upon quinin alone, as the case reported above fully demonstrates. Different drugs and different preparations of the same drug, apparently vary in their action on the defensive agencies of the body. When one drug does not prove effective in bringing about convalescence, another may. In several acute cases, the results from the administration of stovarsol were encouraging, but in most of the cases we were compelled to resort to the use of quinin in order to save life. However, in chronic cases, the results were much more encouraging. Some physicians have strongly recommended the use of mercurochrome in the treatment of malaria. We have given this drug a thorough trial and, from our experience, we can only conclude that in acute cases mercurochrome is without value, but in certain chronic cases of malaria with specific complications, mercurochrome has a beneficial action.

SUMMARY

We must place our reliance upon quinin in some form for the cure of acute malaria.

In chronic relapsing malaria, better results are obtained by combinations of quinin, arsenic, iron and strychnin than from quinin alone.

All complications or debilitating conditions associated with chronic malaria must receive appropriate treatment if we are to obtain optimum results.

In communities where it is impracticable to destroy all breeding places of Anopheles mosquitoes, it is possible to contend satisfactorily with the malaria problem only by educating the entire population to such an extent that they will realize the necessity of maintaining properly screened quarters and remaining in them during the hours between sunset and sunrise.

Screened buildings should be provided for all those engaged in night work, and also for evening public gatherings of all kinds. The holding of public gatherings in the open after sunset should be prohibited.

Every effort should be made to detect and cure persons infected with chronic malaria, as the elimination of these carriers will break the cycle of infection and hence assist materially in reducing the malaria rate in the community.

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IMPOUNDED WATERS AND MALARIA*

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"The utilization of water power is not like the consumption of coal; it does not lessen a natural resource of the country. It is a true conservation of wasted power, and adds to the permanent assets of the country. Also, it is a mighty factor in the development of the country, much in excess of the money cost of the projects. If the reservoirs and ponds of these power developments are a serious menace to the public health, they cannot be allowed. Our aim is to ascertain the extent of damage, if any, to the health of communities by the creation of ponds, and to determine what regulatory measures are necessary to obviate such damage."

Thus spoke the late Dr. Henry R. Carter, Assistant Surgeon General, United States Public Health Service, at the beginning of studies in 1914, under his direction, of the relation of impounded waters to the incidence of malaria in the South. Two things were necessary: There must be no turning back in the damming of

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streams for power development, and the health and lives of the people must be protected.

Hydro-electric power companies had already created extensive reservoirs with the one idea in mind, power for public or private use. The Federal Government had likewise dammed a Southern river for navigation purposes, leaving in its backwater, trees, brush, logs, and flotage—the Anopheles' idea of "the home beautiful." They had not been told, for no one possessed the knowledge for advice, that the troubles and expense were not over when flood rights had been acquired, the dam erected, and the "white coal" was converted to power, or navigation was open. Morbidity reports were filed, not so much with the health board, but with power companies in the form of litigation wherein damage to health on account of malaria was alleged. There was a veritable epidemic of damage suits. North Carolina had them, South Carolina had them, Alabama had them, and others were threatened with serious outbreaks.

These "growing pains" caused justified alarm, and as an immediate result of litigation, scientific research into the relation of impounded waters to malaria was begun by the United States Public Health Service. The unsung and much scarred veteran of many campaigns against "yellow-jack" and other maladies of the tropics and sub-tropics directed these studies with the delving, analytic, deductive mind of the medical scientist and the constructive mind of the engineer (he being both an engineer and a physician). So when Henry Rose Carter died in Washington, D. C., September 14, 1925, he had lived to see waters impounded for the greatest development of the South industrially, and the public health conserved.

Our investigations, extending over a period of 11 years and covering artificial and natural lakes and ponds and streams in five States, gave valuable information not only on the role of impounded waters in relation to malaria but on the entire subject of malaria transmission in the United States. Through these researches the following facts were elicited:

(1) By changing flowing streams into bodies of quiet waters, the biology (to be more exact, the entomology) of such waters is radically changed. All over the South fresh water streams and springs (at a temperature as low as 64° F.) produce Anopheles *punctipennis*, a species of mosquitoes proven capable of transmitting malaria experimentally under artificial conditions. These same streams dammed and transformed into quiet bodies of water add to their production Anopheles *quadrimaculatus*, the great malaria mosquito, if not the sole natural purveyor of this disease in the South.

(2) Generally the amount of Anopheles mosquito production in new ponds is dependent upon the amount, character and location of flotage (leaves, bark, finely broken twigs, etc.) on the surface of the water, whether along shore or resting on water which is 10 fathoms deep.

(3) Pond-breeding Anopheles mosquitoes (*quadrimaculatus*) enter occupied houses at night in large numbers, where production is large. The stream type (*punctipennis*) enters such houses relatively rarely but bites out of doors, mostly at night.

(4) The Anopheles *quadrimaculatus* will fly a mile in quest of a meal of blood.

(5) Epidemics, or serious prevalence, of malaria adjacent to impounded waters in the Southern States are not recorded where the prevailing species of Anopheles mosquitoes was other than *quadrimaculatus*.

(6) The impounding of water generally greatly reduces the production of summer broods of Anopheles *punctipennis* in the area occupied by the pond.

(7) If not properly treated, imported laborers and others, who are already harboring malaria parasites, brought into or remaining in the project area, increase the danger of malaria prevalence. (There must be parasite carriers for the mosquitoes to bite before new cases of malaria are possible.)

(8) Certain measures taken before the impoundage to reduce floatage and the application of anti-larval (wiggle-tail destruction) measures on the pond result in certain prevention of malaria.

The enforcement of statutes, rules and regulations for the protection of the lives and health of the people in each State comes under the police power of the State, a function not delegated by the States to the Federal Government. In the case of regulations for the impounding of water, the health authorities' duties are, primarily, to see that proper safeguards are thrown about the people. Their privileges are two-fold—protection of the public health and assistance in a tremendously important, legitimate industrial development. Alabama, Georgia, South Carolina and Virginia have adopted regulations, the basic principles of which are similar. Alabama coming first, alphabetically, we will mention some of the details of the requirements in this State:

"Any person, firm, corporation, county or municipality desiring to impound water, or who propose to raise the level of an existing pond," shall, "prior to the initiation of any construction activities," make application to the State Board of Health in writing for, and obtain from it, a preliminary permit for the impounding. This applies to any pond from one-tenth of an acre up, provided there is any "permanent human habitation, congregation, or place of business" within one mile of any portion of the proposed pond.

The outstanding virtue in all of the regulation is the provision aiming at the reduction of flotage on the pond, and this is contemplated in the following:

"In the area to be occupied by the reservoir, its

branches, lights and indentations, all brush, trees, undergrowth, logs, stumps and similar objects, which, if not removed, would float or collect flotage on the surface of the impounded water, and all of the above mentioned that are lying on the ground or remaining in new or original position, which would probably cause collection of flotage, and thus constitute conditions favorable to the protection of larvae of mosquitoes capable of conveying malaria, shall be removed, burned, or otherwise satisfactorily disposed of, prior to the impounding of the water."

The foregoing does not include grass, vegetation, brush, trees, stumps, etc., which will be permanently and completely submerged at the time of low water. Among other requirements are the provisions for drainage of pools left in the pond area at low water stage, clearing of the draw-down area, establishment of small ponds for the development of "top-minnows" (gambusia), etc. All of the section relating to preliminary preparation of the area of impoundage need not apply when, in the opinion of the State Board of Health, they are not necessary. After the preliminary requirements have been complied with, approved by the State Board of Health, and the water is impounded, a permit is issued for maintaining an "impounding project," the validity of which permit is contingent upon certain specified measures being enforced to prevent anything "detrimental to public health or likely to cause an increase of malaria."

As an example of the magnitude of the operations required to sanitate a large project area and concomitantly to create a beautiful lake, the Alabama Power Company is nearing the completion of Cherokee Bluffs dam on the Tallapoosa River, 42 miles from the State Capital, which will create a lake covering 40,000 acres, and having a shore line of 700 miles, the largest artificial lake in the world. It would take one walking 10 hours a day one month to cover the distance, on the maximum contour, from one end of the dam to the head of backwater and back to the other end of the dam. If there were a concrete road around the shore line and the same speed laws were enforced that maintain in the towns in this section, it would take one five days to motor around and back to a given point. An airplane could circumnavigate it in a day, but could neither take off nor land at any given point on this rugged line.

This vast area of forest and field is being prepared in accordance with expert knowledge and regulations. The water level of this lake will vary 60 feet, or from elevation 490 to elevation 430. This itself is one of the greatest safety factors against production of malaria mosquitoes. This zone is cleared like a new ground for cultivation, and nothing will be left to protrude above or rest on the surface at elevation 430, the extreme low water. To do the clearing, more than 3,000 men have been employed during the past year. Every employe undergoes a physical examination, a blood specimen for malaria parasites is taken from each, and each man signs an agreement to abide by the company's health rules.

Enormous sums are now being expended by hydro-electric power companies in the preparation of basins and in health work on completed projects, and there are in several states outstanding demonstrations of excellent health conditions where, without having complied with the standards set up by the U. S. Public Health Service and regulations promulgated by state boards of health, malaria might have run rife and industrial assets might have dissolved into liabilities. Power companies are realizing the value of having standards set by legally constituted health authorities in order that they may be complied with, and no negligence can be charged. Specimens of the species of the genus *homo* who are willing to go to any length to harass and extract money from the corporations continue more nearly to reach the period of extinction. "Hydro-electric health" is now becoming an established institution in the South.

DISCUSSION (Abstract)

Dr. M. A. Fort, Bainbridge, Ga.—I would like Dr. Griffitts' opinion of the best and most economical way to handle a project on Spring Creek in Decatur County, Georgia.

The dam of the power company was destroyed by the floods of January and February, 1925. There has been no rain of account since then, and the water has been very low all summer. Investigating at intervals, I occasionally found a few *quadrimaculatus* larvae in the holes in the creek bottom, none in the creek itself, and no adults in the homes on the hill.

The dam was repaired in late summer and the pond slowly began to fill up. In early fall the homes for a mile from the pond were full of *quadrimaculatus;* they were found in hollow trees all the way to the pond, and larvae were found all over the pond in flotage. The pond is five or six miles long, one-quarter mile wide, and full of large and small trees and bushes. If we required this growth to be removed, it would bankrupt the company. Gambusia are scarce since the flood. The stage is all set for an enormous production of *quadrimaculatus* next spring.

Can Dr. Griffitts suggest a feasible way of controlling this pond?

Dr. L. D. Fricks, U. S. P. H. S., Memphis, Tenn.—Nearly all we know about this subject, "Impounded Waters and Malaria," is the result of studies conducted by the Public Health Service. Carter, LePrince and Griffitts have contributed most of this information. Studies of impounded waters in relation to malaria have been conducted by the service in the Southern States for more than 10 years, and as Dr. Griffitts has pointed out, we know the general principles involved in the impounding of waters as they relate to malaria, and the general measures which should be applied for the control of mosquito production in and malaria around these projects.

There is only one phase of this subject which I desire to call to your attention at this time. It has sometimes seemed to me that the relative importance of large impounded water projects in relation to malaria can be easily exaggerated as compared with the smaller ponds and breeding places of malaria mosquitoes. The Public Health Service found it convenient to spend most of its time in the study of the larger impounded water projects in relation to malaria, and most of the published reports deal with the larger bodies of water. But the fact that the studies were made, generally speaking, of large impounded water projects should not lead us as public health officials to ignore the smaller, closer, and perhaps more dangerous, malaria-producing bodies of water which are to be found on the outskirts of our towns and in the immediate vicinity of the farmers' homes.

Dr. S. W. Welch, Montgomery, Ala.—The State Board of Health of Alabama believes that top-minnows are the first line of defense against malaria. It is the policy of the board to require all corporations impounding water in the State to stock the ponds plentifully with gambusia while the water is being impounded. We do not rely solely upon minnows. We require oiling under certain conditions and quininization in others. We believe so strongly in the standard quinin treatment that a question dealing with the standard quinin treatment is asked at every examination given by the State Board of Medical Examiners to applicants for certificates to practice medicine in Alabama. We do not think that any one measure can be relied upon to control malaria, but we do believe that top-minnows is one of the best measures we use.

Dr. Griffitts (closing).—It is not practicable to advise Dr. Fort on a feasible way of controlling the pond he refers to without basing the advice on first-hand knowledge of conditions. I am not in favor of what might be termed "dry-footed" advice on malaria prevention. We have been able, however, to greatly reduce *quadrimaculatus* production in some uncleaned ponds by forcing boats through and applying oil under high constant pressure. With the dam out only a few months, there may be a marked decrease in flotage next season and a proportionate decrease in Anopheles breeding. A word as to gambusia and other "top-minnows:" there are times and conditions when they are similar to nostrums—90 per cent advertising and 10 per cent predation.

OBSERVATIONS ON THE MALARIA PROBLEM OF TODAY*

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The progress which the South has been making in malaria eradication is amazing. For the Southern States combined the malaria death rate has diminished from 12.4 per 100,000 in 1917 to 5.7 in 1923. In the Mississippi delta, which for many years has been intensely a malaria region, and which has a population of over 400,000, the number of cases of malaria has diminished from 64,000 in 1915 to 38,000 in 1924. The number of deaths has diminished during the same number of years from 656 to 182. Similar progress is reportable for most of the centers of malaria infection which have given so much serious concern in the past.

But while the problem is one of less concern today than in former years, it remains as the outstanding health question of the Southern States. Neglect in matters of precaution, particularly mosquito extermination and isolation of carriers, easily leads to a return to former conditions. What we are most in need of at the present time is the active cooperation of business organizations and large corporations having a vital interest in the health of the community. I would, therefore, suggest to you, and most urgently, the appointment of a special committee on publicity and cooperation whose duty it should be to enlist such cooperation as may be available in different sections of the country, and give the widest dissemination to the available information on malaria prevention and control. If such a committee should be appointed, I would be very glad indeed to assist in every way possible. What remains of malaria in the Southern States is none the less a serious problem, regardless of the progress that has been made. The disease is unquestionably today of a milder type, but it continues to complicate practically every important cause of death. Even mild forms of malaria impose an enormous economic loss upon the community. I will not venture into the realm of conjecture by estimating the annual loss, especially to plantations, but it

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must reach in some sections in considerable proportions. Many areas of great productive possibilities are undeveloped because of the malaria factor. Many cities and towns are non-progressive on this account. From a real estate point of view, malaria is probably the greatest of all hindrances.

I would fail if, in this connection, I did not give expression to my profound appreciation of the excellent work that has been done by the United States Public Health Service in keeping the facts of the malaria situation and the methods and means by which it may be improved continuously before the public. But we are in need of a still more aggressive policy if the remaining evil is to be dealt with to the best advantage of all concerned.

OPPORTUNITIES FOR PROGRESS IN MALARIA ELIMINATION*

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Those of us who have been occupied with public health activities for a number of years realize that it takes considerable time and effort to arouse and maintain public interest in sanitation, and that it is frequently difficult to measure the result of strenuous effort. On the other hand, it is possible to arouse considerable interest without being able to know how much good we have really accomplished. Any expression of popular approval of sanitary accomplishments must follow the selling of the value of applied sanitation to those directly benefited, i.e., to those who control the industrial purse-strings.

With regard to malaria control, our biggest problem is to determine the best way to get the public to become active in assisting the person directing control measures. By the public is meant the individual, the community, and the group of communities that make up the county.

There is a possibility of the health worker's trying to do by himself what many others could be made willing to do for him, and of thus accomplishing what he is trying to do, and having it done in a much shorter time, and hence at less expense to the general public.

While it is wise and proper for a county health officer or his assistant to spend considerable time trying to persuade one or more property owners to screen their homes or drain some sources of Anopheles, yet how much more satisfactory it would be if other persons voluntarily did this for him and caused the sanitation converts to come to the health officer for advice as to procedure. Could, or would, such a scheme work?

Today our malaria is confined largely to that part of the South where cotton is grown. In a large section of this territory, and where the best cotton crops are raised, these crops are financed by our banking institutions, and the bankers as well as the planters incur considerable risk because of the malaria hazard. The risk can be largely overcome by applied sanitation, but we sanitarians have failed as salesmen to present this fact in an effective way to the bankers of the cotton belt. We can rely on the bankers taking all necessary precaution to protect their loans, and it should be our business to show them how such risks can be reduced. No banker loaning money on a cotton crop desires a reduced yield due to labor inefficiency, and we should show him how this can be overcome at minimum expense so that he may profit by it.

Assuming that a committee of bankers come to you tomorrow morning and asked you as a health officer what you could recommend as the least expensive measures to protect the farm labor and thus insure the repayment of farm loans by a good crop in a highly malarious district, what answer would you give them? What would you suggest that they require of the cotton planter in connection with the bank loan to be made that would not embarrass the planter?

Some investigations made by the United States Public Health Service in the most malarious sections of the Mississippi delta have brought out several startling facts:

(1) The cotton plantation owners in general are of the opinion that it is not practical to prevent negro farm tenants from abusing the screening placed on tenant houses.

(2) The negro tenants often pay almost as much for bed net mosquito bars as it would cost to keep their homes effectively screened.

(3 Where the need of proper care of the screen has been properly explained to the negro tenants, they have

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taken better care to keep the screen intact than is done by white farmers owning their own homes.

(4) The item of "proper persuasion" is the key to the situation.

It is possible that in most instances negro farm tenants can be protected from malaria by the screening of their homes, and that in most instances the cost will not be much above what the tenants are now paying for bed mosquito bars. In many instances the negro farm tenants after understanding the situation have promptly and willingly given their time and labor toward the effective mosquito proofing of their homes.

Our railroads are intensely interested in the size of the crops produced, the amount of cotton, agricultural products, lumber, and freight to be hauled.

The Cotton Belt Railroad made a decided profit by carrying on a malaria campaign, and it was not long before the Missouri Pacific and Rock Island Lines started similar campaigns because of the potential profits that are apparent.

If we ask the question why the railroads in this section of the "malaria belt" are doing intensive anti-malaria work profitably while the railroads in the other malarious sections are ignoring present and future profits, what would the answer be? It is as plain as a flag staff. Sanitarians have failed to sell the idea to the general managers of railroads east of the Mississippi River.

Along our southeastern coastal plain there are thousands of unused acres of good farming land. In a large number of instances the failure of the development of this territory is caused by potential or actual malaria prevalence. The railroads traversing it have good general managers and active agricultural development agents, but they do not know that failure of attempted development is often caused by actual or potential malaria prevalence. When the railroad executives wake up to these facts, we shall see a decided change in the status of development.

Surely we need an active subcommittee on publicity in our National Malaria Committee to get such facts as these to business executives and commercial interests who can use them and indirectly be of assistance to us in our efforts to get rid of malaria.

If such a committee sold the general manager of one railroad, we might mention, then, that within a few years its income through hauling more freight could be appreciably increased, and incidentally its reduced actual losses would pay several times what its campaign would cost.

We all realize that in malaria-infected regions the elimination of this disease will bring increased profits to owners of farm lands, to town merchants, employers of labor, banking interests, lumber operators, insurance agencies, farmers, railroads, and assist state development associations, but these agencies have not analyzed the project yet, and we as sanitarians must see that it is our duty to get them to do their part.

If any county or state health officer had but a few of these agencies interested in his malaria control campaign, there would be no question about the increased rate of progress that would follow. A way must be devised to get the business and banking associations to sponsor our efforts at malaria elimination. It will mean increased business and increased profits to them.

When the Bankers' Association of Arkansas recently cooperated with the Missouri Pacific Railroad and a "Better Health Special" of eight cars was sent to a large number of small communities throughout the state, the farmers and their families from distant homes came to the train by hundreds day after day, station after station, and it indicated most clearly and definitely what can be done by railroads and associations of business men in getting the rural people interested in applied sanitation and malaria control.

Now that we have general managers of state boards of development, of railroads, and officials of a state bankers association, interested in our problems in several states west of the Mississippi, the outlook is more encouraging. It has been clearly demonstrated that it is possible to interest commercial agencies in at least one phase of rural sanitation, and that a large amount of constructive work is being done through their efforts. It is equally evident that other commercial agencies will be ready to accomplish similar undertakings as soon as their directors understand that such efforts can be so planned and directed as to result in increased profits and increased business. There is a golden opportunity awaiting a general committee on commercial relations of the National Malaria Committee. The question is: Are we going to measure up to this opportunity?

DISCUSSION (Abstract)

Dr. W. S. Leathers, Nashville, Tenn.—All of us who have been engaged in public health work for the past several years realize that not only has very definite progress been made in the reduction of malaria incidence in those sections of the country where malaria is prevalent, but with this achievement there have accrued increased opportunities for continuing the work of malaria control upon an even more effective

basis. One of the most encouraging indications at the present time is the intelligent interest of commercial organizations such as the boards of trade in the respective states in the economic aspects of this problem.

The prevention of malaria is not only a question of improving the health of the people among whom it exists, but it also has a far-reaching effect in improving the economic conditions of a locality. There are areas in the Southern States, notably in the Delta of the Mississippi River which, if freed of malaria, would have enormously increased real estate values. It is already acknowledged that the fertility of the soil in this area exceeds that of any other region in the world and the great need at the present time in improving the industrial and agricultural development of this territory is to eliminate malaria. The achievement of this will be the most significant factor in bringing about not only improved civilization, but in making this large agricultural territory the outstanding region in agricultural production throughout the country. This fact is beginning to reach the minds of those who occupy positions of leadership in the business world and there can be no question that in a relatively short time, measured in terms of human accomplishment, malaria will be under complete control throughout the Southern States particularly, as well as in other parts of this country. It is imperative in this connection for the health officials of the respective states to continue their efforts along educational lines looking to the achievement of this result in the shortest period possible.

PREVALENCE OF MALARIA (1925) IN PARTS OF DELTA OF MISSISSIPPI AND ARKANSAS: ECONOMIC CONDITIONS*

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That portion of Mississippi known as the Delta lies between the Yazoo and the Mississippi Rivers, embracing 12 counties. It is a region almost wholly given over to the growing of cotton, one of the counties (Bolivar) producing more cotton than any other county in the United States.

Practically the whole of the cotton crop in this region is grown on large plantations worked by negro labor. Any factor which interferes with the necessary supply of this labor is of great economic importance. The prevalence of malaria, therefore, with its peculiar seasonal incidence, may be a limiting factor in the production of the crop, interfering with the cultivation, and especially with the picking of the crop.

This section of the State has suffered an unenviable reputation for unhealthfulness in the past, due in large measure to the prevalence of malaria. It is well known that in any given community the negroes have a higher infection rate than the whites, an important matter in this section in that practically 80 per cent of the population of the Delta counties is colored.

The former prevalence of malaria in this region led us to undertake some work with the aim of getting some definite measured estimate of the amount of malaria present, and to secure data on the economic condition of the negro tenant, in certain parts of the Delta, during the present season of 1925, and to compare our results with other findings obtained some 10 years ago in the same territory.

During the spring of 1925, a number of rural negro school children were examined for malaria parasites, using the thick film technic. One hundred and ninety-six children were examined during the month of April, 10 being found positive, or 5.1 per cent. Three had the tertian type and seven had the estivo-autumnal type of malaria. These children were those of plantation negroes. As it is known that wherever malaria is prevalent children are more heavily infected than adults, school censuses tend to show a rather higher percentage of malaria than that of the general population. The results of this survey should be contrasted with the findings of Mayne,[1] who, during February and March, 1915, just 10 years ago, and within 50 miles of our own territory, examined by thick film 1,184 persons, finding 492 infected, or 41.55 per cent. Sixty-four and four-tenths per cent was estivo-autumnal, and 35.6 per cent was tertian. These findings should be compared with ours of 5.1 per cent.

Following up this work, blood examinations were made of negro plantation workers and their families in the vicinity of Greenwood, Miss., and around Lake Chicot, in Arkansas, a region lying across the Mississippi River from Greenville, Miss. Two series of examinations were arbitrarily made in each region—one, the non-selected group, including all persons on several of the plantations, and the other, the selected group, being those who at the time of the ex-

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*Read before National Malaria Committee (Conference on Malaria) meeting conjointly with Southern Medical Association, Nineteenth Annual Meeting, Dallas, Texas, Nov. 9-12, 1925.

TABLE I.

Comparison of Malaria Parasite Rates in Mississippi Delta

Observer	Locality	Year	Season	Type of subject	Number examined	Per cent positive
Mayne	Scott, Miss.	1915	Feb.-March	Plantation negroes	1,184	41.55
Barber	Greenwood, Miss.	1925	April	Negro schools	196	5.1
Derivaux and Haas	Lake Village, Ark.	1916	March-April	Plantation negroes	430	16.0
Barber	Lake Village, Ark.	1925	Aug.-Sept.	Plantation negroes	288	3.8
Bass	Bolivar County, Miss.	1916	Year	Plantation negroes	31,459	22.2
Barber	LeFlore County, Miss., and Lake Village, Ark.	1925	Aug.-Sept.	Plantation negroes	537	5.5

aminations were sick, or who gave histories of recent illness, either of malaria or some other ailment. The prevalence of malaria in the non-selected group gave the incidence of malaria in the general population, and the findings in the second group gave the portion of the sick rate due directly to malaria.

Of the non-selected group, 234 persons were examined on a plantation near Greenwood, Miss., and 288 on several plantations on the shore of Lake Chicot, near Lake Village, Ark. These examinations were made during the latter part of August and the first week of September, during the season of highest malaria prevalence. The rate for the Greenwood plantation was 5.55 per cent, while for the Lake Chicot group it was 3.8 per cent.

These rates should be compared with the results of examinations made by Bass[3] and his coworkers during 1916-1917 in Bolivar County, Mississippi. These examinations, extending over a period of a year, showed infection rates of 17 per cent for whites and 22.2 per cent for colored in a total population of 31,459, 82 per cent of which was colored. In some parts of the area surveyed the rate rose as high as 84 per cent of the population, among certain small communities (Kimball Lake). (See Table I.)

The Lake Chicot group should give an excellent idea of the changed conditions in this region with regard to malaria prevalence, as in April and May, 1916, Derivaux and Haas[2] surveyed a number of plantations on the shores of Lake Chicot, examining by the thick film method 430 persons, 79 white and 351 colored, finding 16.04 per cent infection. Our survey nearly 10 years later included the same plantations, and in many cases the identical persons examined by Derivaux and Haas. As stated above, our survey showed a rate of 3.8 per cent as compared with theirs of 16.04 per cent. (See Table I.)

Of the selected group, a population of 1,953 was involved in the survey, of which 612, or 31.3 per cent, gave sufficient history or indication of illness to be examined for malaria parasites. One hundred and one proved positive for

TABLE II.

Selected Group, Greenwood, Miss., and Vicinity

1925 Month	Number homes visited	Population	Number examined for malaria parasites	Number positive	Percentage positive	E. A.	B. T.	Q.
June	17	95	23	4	17.4	3	1	.....
July	221	1,151	376	67	17.8	50	16	1
August	147	707	213	30	14.1	22	8	.....
	385	1,953	612	101	16.5	75	25	1

malaria, or 16.5 per cent of those examined. Table II gives the figures for this group.

It should be strongly emphasized that even of this group of malaria cases the disease as a cause of disability was a negligible factor. In fact, only 16 gave indication of illness from malaria at the time a blood specimen was taken. One of this number also had pellagra, two had typhoid, another with a heavy estivo-autumnal infection had a "headache," and only two were ill enough to go to bed with malaria as their only complaint. The remainder had either no serious symptoms or chills and fever not sufficient to prevent them from being up and around.

In the Lake Chicot group, taken early in September, only one of the positive cases, a small child, was sick enough to be in bed. One woman with chronic appendicitis also showed a heavy crescent infection.

During the season of 1925, from April 1 to November 1, malaria slides submitted to us by local physicians practicing in the Greenwood neighborhood have been examined by thick films stained with Giemsa. In all, 99 slides of cases suspected of having malaria were examined. Of these, six, or 6.1 per cent were positive.

During the months of September and October, 1925, routine examination of the blood of all patients at a local clinic at Greenwood has been made by a competent microscopist, using thin films stained with Wright's stain. In September, two positive slides were found of 36 examined, and in October one positive slide was found in 40 examined.

In the course of the surveys, an attempt was made to get information as to various factors which might influence the well-being of the negro tenants, and to this end a card was filled out at every home visited, with details as to the condition of the people and of the house, necessarily a rather vague classification, depending largely on the personal equation of the inquirer; the number of persons living in the house; whether the house was screened, whether mosquito nets were used, the number of Anopheles mosquitoes found in each house, the source of the water supply, whether or not there was a kitchen-garden, a cow, poultry or hogs. As an index of general prosperity, the possession of an automobile was also noted. The results of this survey of economic factors is given in the table below.

The preponderance of flowing artesian wells in this region should be remarked, as the excellent water furnished by them may also provide

TABLE III.

Summary of Factors Included in Economic Survey of Delta Plantations

Number of families visited				456
Condition of people—				
Good			67	
Medium			279	
Poor			78	
Unclassified			32	
				456
Condition of houses—				
Good			40	
Medium			335	
Poor			50	
Unclassified			31	
				456
Houses with some screens			102	
Families using mosquito nets			180	
Families with no mosquito protection			137	
Houses examined for Anopheles—				
June	16	Anopheles found	21	
July	128	Anopheles found	156	
August	59	Anopheles found	26	
Arkansas (August)	27	Anopheles found	54	
	230		257	
Kind of water supply—				
Artesian well (flowing)			240	
Pump (shallow well)			207	
Open well			1	
Spring			2	
Lake			6	
				456
Families having kitchen-gardens			409 out of 456	
Families keeping cows			215 out of 340	
Families keeping poultry			312 out of 340	
Families keeping hogs			264 out of 340	
Families having automobiles			58 out of 456	

breeding places for Anopheles mosquitoes. Dr. C. C. Bass has had considerable experience with these flowing wells in his malaria campaign in Ruleville, Sunflower County, in 1918, and found that they constituted there the chief source of the town's mosquito supply.

In the course of the survey, an attempt was made to determine how much migration from place to place occurred among the negro population. Inquiry as to this was made of 438 families. The chart below shows the result.

SUMMARY

In summarizing the results of this investigation, certain factors which influence our find-

TABLE IV.

Less than one year in present dwelling	55 or 12.5 per cent
One or two years	94 or 21.4 per cent
Two to three years	73 or 16.6 per cent
Three to four years	57 or 13.0 per cent
Four to five years	38 or 8.6 per cent
Five to ten years	73 or 16.6 per cent
Over ten years	48 or 10.9 per cent
Total	438

The shortest time noted was one month, and the longest, regarding which there is considerable doubt, is 50 years.

Two hundred and twenty-two, or a little more than 50 per cent, had lived in their present dwellings less than three years.

The bearing of this migratory habit on any attempt at amelioration of the malaria situation by means of quinin therapy or by a better housing program is obvious.

ings should be mentioned. The years 1924 and 1925 were years of subnormal precipitation during the malaria season, which doubtless affected the anopheline population, and through it the prevalence of malaria. Dr. R. D. Dedwylder, County Health Officer of Bolivar County, Mississippi, who has had wide experience in malaria work, thinks that the subnormal precipitation for the past five years has been the largest factor in causing the reduction he has noted in rural malaria in Bolivar County.

Improved economic conditions during the last few years, due to larger crops and better prices, is another factor which must enter into the situation. The negro migration to the North, leaving fewer laborers to produce the cotton crop, may have tended to increase the labor income of the negro tenant. Surely the fact that over 12 per cent of the families surveyed possessed automobiles is of significance, especially in view of the fact that our census was taken during the "lean" months, that is, long after the tenants had realized on their 1924 crop.

The universal testimony of the practicing physicians of the Delta region that there has been a great decrease in malaria prevalence during the last 10 years is also substantiated on comparison of the results of our surveys with those obtained by competent investigators 10 years ago in the same territory. We do not pretend to account for this decrease, as the main purpose of this paper is to present the facts obtained by our surveys, and to get them on record as a basis for further work.

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DISCUSSION (Abstract)

Dr. F. J. Underwood, Jackson, Miss.—The calculated economic loss in the state of Mississippi from malarial fever during the year 1924, was $2,355,775.

As this discussion pertains generally to the Mississippi Delta region the proportion of this economic loss charged against this section of the state which embraces 14 counties and 8,284 square miles and 25.4 per cent of the state's population is given as $1,137,425, or approximately 50 per cent of the whole.

In the remaining 68 counties of the state there are 38,078 square miles and 74.6 per cent of the population.

The Delta Section of the State of Mississippi is commonly known to embrace the territory lying between the Mississippi River and the chain of hills extending from the Tennessee line, south of Memphis, southwest to Vicksburg.

The alluvial territory is flat, being protected from the high waters of the Mississippi River by levees. The natural drainage outlet of this vast territory is through the Yazoo River, which enters the Mississippi River at Vicksburg. When the Mississippi River is at flood stage, the drainage in this entire territory is seriously impaired. As a protection to property, numerous "drainage districts" have been established and levees built along the banks of inland rivers and their tributaries. Spring floods are common in this section.

Malaria control is considered to be one of the extensive development projects in the State of Mississippi.

I am pleased to say that the Mississippi State Board of Development places first, upon their program of furthering the progress of Mississippi, the control of preventable diseases, and fully realizes the handicap which malaria presents to the progress of the Delta region. Active cooperation has been received from this Board, and their future plans include the working hand in hand with the Mississippi State Board of Health to develop the man power in the state to as near 100 per cent efficiency as possible.

During the last few years the plan to control malaria has been definitely extended to include county-wide projects.

Some interesting data was obtained this year relative to the economic bearing of malarial fever in the Mississippi Delta with reference to their abundant cotton crop, and some of the information gathered follows:

In one of our delta counties a study of fifteen plantations showed that there was a labor turnover of 36 per cent. Malaria rates were gathered by taking histories which revealed that on these fifteen plantations there was a malaria rate in 1924 by homes of 29.2 per cent and by persons of 9.2 per cent.

Segregating these plantations and collecting 1925 data, we find that during the first half of the month of September, there were approximately 50 cases out of 225 workers, each case averaging two days loss from work.

On another plantation it was found that 26 workers out of 74 had malaria this year, the majority during the latter part of August and the first part of September.

In another section of the county there were approximately 25 cases out of 400 workers. In additional territory there were 82 cases out of 1,100 workers scattered over an area of 10 square miles. On another plantation there were 15 cases out of 25 families.

In the territory above referred to, malaria came to a peak in August and decreased only slightly during September. During the whole summer and up to September 24, the weather was fair with no rain. It may be said that September was ideal for picking cotton up to the twenty-fourth. An inquiry showed that during this important picking time malaria was at its peak and caused serious inconvenience in gathering the crops. Blood smears were taken from a group of apparently healthy, normal school students during August. Out of 52 specimens five were found to be positive. These subjects were from all parts of the Delta.

Of 33 slides taken on September 9, on one of the plantations, five were found to be positive. The sec-

tion from which these slides were taken does not report a high malaria rate. On another plantation in one of the highest malarial sections, four out of 20 blood smears were found positive.

It may be interesting to note here that a comparison was made in the Mississippi Delta between two counties, one of which has conducted malaria control work for the past four years and the other was surveyed this year with a view of establishing malaria control in 1926.

The two Chambers of Commerce were written requesting information relative to the percentage of cotton crop that had been gathered up to the month of October, and requesting information as to the reason for the amount so far taken out of the fields.

In the county in which malaria control has been in force for the past four years, the Secretary of the Chamber of Commerce reported that up to 75 per cent of the crop had been gathered and attributed this early gathering to three factors:

(1) Excellent health of labor.
(2) Excellent weather.
(3) Early opening of entire crop.

The Secretary of the other Chamber of Commerce reported the crop to be about 45 per cent gathered, giving the reason that the shortage of labor had proved a great handicap, and also stated that the malaria situation had interfered very little with cotton picking according to information received from the planters themselves, and from the County Agent, who was in close touch with the situation.

The true malaria condition of this latter county was definitely known by the State Board of Health and the secretary of the Chamber of Commerce was given the information with the result that the economic value of malaria control was realized and the matter placed before the Board of Directors for consideration. The State Board of Health asked what kind of cooperation was necessary and what financial aid the Chamber of Commerce could render in the efforts being made to stamp out malaria.

In this discussion facts showing the darker side of Mississippi's malaria prevalence have been given in an attempt to bring out the handicap which the presence of malaria fever is to the program of the Mississippi Delta.

However, the morbidity rate has dropped in the Delta Section from 13,303 per 100,000 to 8,223 since 1920 to 1924, and for a like period the mortality rate has dropped from 100.4 per 100,000 to 43.8.

The economic importance of controlling malaria is fully realized in Mississippi and forms the foundation of the plan to control this disease.

Dr. W. S. Leathers, Nashville, Tenn.—From the statistical data presented by the paper of Dr. Barber and Mr. Komp indicating clearly that there has been a measurable reduction in malaria incidence in the Mississippi Delta during the past ten years.

During the demonstration for the control of malaria conducted under the auspices of the Mississippi State Board of Health in cooperation with the International Health Board and under the scientific direction of Dr. Bass, it was rather exceptional to find cases of hematuria. Judging from this observation together with other information available, the malignant types of malaria are not nearly so common at the present time in the Mississippi Delta as formerly, which is also an indication that the disease is occurring in milder form than heretofore. This is one of the signs of the disappearance of a disease which has shown serious proportions in relation to the public health. It is also true that the mortality statistics as recorded in Mississippi indicate unmistakably that malaria is disappearing with encouraging rapidity. In 1920, the total death rate for Mississippi per 100,000 population was 40.3, while in 1924 it was 20.4. The total death rate among the whites was not so high as that among the colored race, being 23.3 in 1920, and in 1924 11.8. The total death rate among negroes in 1920 was 55.8, while in 1924, it was 28.2. In 1916, the maximum number of cases of malaria reported to the State Department of Health was 159,000, these reports being made by approximately 90 per cent of the doctors of the State. In 1924, the number of cases of malaria had decreased to 79,600. The white population of the state showed a decline of malaria incidence of from 76,000 in 1916 to 41,000 in 1924. When it is known that in 1916 there were 1,492 deaths from this disease and 365 in 1924, it is obvious that the facts which have been presented in the paper which has just been read are re-enforced.

There has been no greater achievement in this country during the past twenty-five years in public health work than the success which has been attained in the control of malaria. There are unquestionably a number of factors involved in this result, such as relative precipitation and improvements in economic conditions, but it is well to emphasize and continue to stress the important fact that the various official and voluntary health agencies of the United States have been active in carrying on a definite and aggressive campaign against this disease and it is, therefore, reasonable to suppose that the most important factor in the reduction of malaria has been the efforts of the national, state and local departments of health, including the operations of the International Health Board. With continued improvement in the economic conditions of the citizenship of those areas in which malaria is prevalent and with more emphasis upon improved agricultural conditions by drainage, particularly sub-soil drainage, unquestionably there will be a continuous decrease in the incidence of malaria. There is no reason why the disease cannot be largely eradicated from the Southern States during the next fifteen or twenty years.

STUDIES ON BIRD MALARIA*†

By ROBERT W. HEGNER, PHD.,
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(1) *Biological Studies of the Course of Infections in Canaries.*—Ever since the organization of the School of Hygiene and Public Health in 1918, work has been going on in the Department of Medical Zoology on bird

*From the School of Hygiene and Public Health, Johns Hopkins University.

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malaria. Those who have taken part are, in chronological order, Dr. E. R. Whitmore, Dr. S. Ben-Harel, Dr. G. H. Boyd, Dr. L. G. Taliaferro, Dr. K. S. Drensky, Dr. R. F. Feemster, Dr. C. F. Scudder, Dr. E. H. Shaw, and Mr. E. Hartman. The organisms used in our investigations consist of two strains: one was obtained by Dr. Whitmore from sparrows in New York in 1913, and the other by Mr. Hartman from sparrows in Baltimore in 1924. The experimental animals used have been canary birds, *Serinus canarius*. Our studies may be separated into two types: (1) biological and (2) therapeutic. Experiments on therapeutics have involved free-living protozoa as well as the malarial organism.

Canary birds and their malarial organisms of the species *Plasmodium precox* are of peculiar value as material for the study of certain problems in malaria. In the first place it is worthy of note that the sexual phenomena in the life cycle of the malarial parasite of man was discovered by McCallum only after he had observed the process in a related organism in birds. Furthermore, the discovery of the transmission of malaria from one vertebrate host to another was first made by Ross on bird malaria and later confirmed by Grassi and others for human malaria. The organisms of both bird malaria and human malaria are similar as regards the stages in the life-cycle, morphological characteristics and clinical effects on the host, and in both the response to quinin treatment is such that complete sterilization often fails. Canary birds are easily obtained at a reasonable cost and can be kept in large numbers in the laboratory. Infections are easily made by the inoculation of blood from an infected bird into the breast muscles or peritoneal cavity of a clean bird. The course of these infections in birds resembles very closely that of human malaria and the results obtained from their investigation can be translated more or less directly into terms of human malaria. It is possible, moreover, to carry out experiments on birds that cannot be performed on human beings, and thus the way is opened up for study of problems that cannot be attacked in human malaria.

All of our work has a bearing on the problem of relapse which I believe to be the most important problem in malaria at the present time. Dr. Ben-Harel studied the localization of the parasites in the internal organs at various intervals after the subsidence of the acute infection; Dr. Whitmore carried on experiments on the action of light on relapse; Dr. Taliaferro's work on the resistance of hosts to the multiplication of blood inhabiting parasites has a bearing on this subject; and our studies on therapeutics are directed particularly toward the discovery of an agent that will actually rid the body of all malarial parasites. If the last named project is successful the eradication of malaria in certain regions will be very simple since mosquitoes do not carry the organism through the winter and can only become infected in the spring by biting human beings who are suffering from a relapse of an infection of the previous year that was not entirely cleared up.

Before experimental work could be done the natural course of the infection of birds with *Plasmodium precox* was worked out. This involved both studies of the infection as revealed in the peripheral blood and in the internal organs. Whitmore found that blood from a bird that had been infected was capable of setting up an infection in a clean bird many months after parasites could be found in the blood by ordinary examination. This proved that parasites remained in the blood of an infected bird in small numbers for a considerable period, in one case for twenty-nine months (until the death of the bird) and usually probably throughout the life of the bird.

The course of the infection in birds has been studied carefully by Ben-Harel and Boyd. After infected blood has been injected into the breast muscles of a clean bird a period of incubation ensues lasting from 3 to 11 days, the average length of time being 5.33 days. During this period of incubation and before parasites appear in the blood the number of red cells decreases. For example, Ben-Harel noted in one bird a decrease from 4,785,000 per cmm. to 4,000,000, and in another bird a decrease from 5,000,000 to 4,150,000. The period of incubation is followed by a period of rise in parasite number which lasts from 2 to 10 days, with an average of 5.33 days. The number of parasites increases rapidly until the peak is reached. At this point there may be from 10 to 5,000 parasites per 10,000 red cells. No reason is known for this great variation, but work on this point is now in progress. A continued decrease in red blood cells occurs during this period, often reaching 50 per cent of the normal number. The blood forming organs, however, are stimulated to hyperactivity and many young cells appear in the blood, and soon after the acute attack has subsided the number of red cells

again reaches normal and often advances beyond the usual number. The fall in the number of parasites in the peripheral blood is as rapid as the rise. The factors responsible for this fall in numbers are not known, but data presented below have a bearing on the subject. After the fall in numbers parasites are still present in the peripheral blood, apparently, throughout the life of most birds although in very small numbers.

The first attempt to study periodicity in bird malaria statistically was made by Mrs. Taliaferro in Baltimore and later at the University of Chicago. She made blood films at four-hour intervals for periods of several days during various stages of the infection. The mean size of the asexual stages of the parasites was determined from this material at different times of the day, and the data obtained treated by statistical methods. It was found that there is a definite periodicity in bird malaria, and that this periodicity exists at every stage of the infection, during the chronic period after the number of parasites has decreased to such an extent that very few are present in the blood, as well as during the acute period. Furthermore, the fact was established that the period for the asexual cycle in the Baltimore strain obtained in 1924 was 24 hours in length and that each stage in the asexual cycle appeared at a particular hour of the day. For example, fully grown schizonts appeared at 1:00 p. m., many dividing schizonts at 5:00 p. m., and small merozoites at 9:00 p. m. When this strain was studied at Chicago these various stages were noted one hour later, due to the change from Eastern standard to Central time. As in all malarial infections some of the parasites were more advanced than others and some lagging forms were present, but the majority maintained a precise periodicity. The New York strain that had been continued by subinoculation in canaries for 11 years likewise exhibited periodicity, but in this case the total asexual cycle occupied 30 instead of 24 hours. Whether this difference is due to a genetical difference in the parasites or a change due to the long continued asexual multiplication without the intervention of sexual stages is not known. The fact of periodicity proves that there is no change in the rate of multiplication of the parasites during the course of the infection and indicates that we must look elsewhere for an explanation of the rise and fall in the number of parasites. Dr. Drensky has been able to confirm Dr. Taliaferro's results on periodicity with the Baltimore strain.

The internal organs most profoundly concerned in a malarial infection are the spleen and bone marrow. The spleen according to Boyd, begins to enlarge as soon as parasites appear in the blood and reaches from 8 to 10 times its normal size at the peak of the infection, being often very dark and hard. As the infection subsides it decreases in size but seldom regains its normal dimensions and color. Studies were made by Ben-Harel and Feemster of the spleen and bone marrow by means of smears and sections during various stages of the infection. These studies prove that the number of parasites in these organs just after the fall in numbers in the peripheral blood is not sufficient to account for this decrease. Apparently most of the parasites are destroyed by some type of host resistance and are not stored up in the tissues. Normal asexual stages of the parasite were found in these organs in four birds during the latent period, two weeks, one month, 2½ months, and 6 months after the fall in parasite numbers in the blood. This proves that asexual reproduction takes place during the latent period. Since Dr. Taliaferro has shown that the rate of reproduction is maintained during this period, the failure of the parasites to increase in the blood must be due to some type of host resistance which kills off most of the parasites as soon as they are produced. It follows that the lowering of this resistance would allow more of the parasites to develop and, if the resistance were reduced sufficiently over a long enough period of time, would result in relapse.

Experimental studies of the course of infections with bird malaria were carried out by Dr. Boyd. The influence of variations in the number of parasites inoculated was first investigated. Five birds, each inoculated with 100 parasites, did not become infected. Later they were infected with large doses, which shows that no lasting immunity ensues when too few parasites are inoculated to bring about an infection. Of seven birds inoculated with 1,000, two became infected and five did not. Five of six birds inoculated with 10,000 became infected. The detailed data from these experiments show that a high correlation exists between the size of the dose and the length of the incubation period. The latter decreases as the dose is increased. A less pronounced positive correlation is evident between the size of the dose and the height of the peak; and there is no correlation between the number of parasites inoculated and the length of the period of rise.

To determine comparative numbers of parasites in the blood serum, whole blood, washed red cells and serum from infected birds were inoculated into clean birds. Ten birds were used for each type of experiment. Differences were noted in the number of birds that became infected, in the length of the incubation period and in the number of parasites. All birds inoculated with whole blood and washed cells were positive; whereas only 4 of 10 inoculated with serum became infected. The incubation period rose from three days in birds inoculated with whole blood, to 3.6 in those inoculated with washed red cells, and to 7.75 in those inoculated with serum. The average number of parasites per 10,000 red cells was for the whole blood series, 1,348; for the washed red cell series, 765; and for the serum series, 352. These results prove that during a normal infection the number of parasites free in the serum is very small, except, of course, at the time of merozoite formation, and that there is probably no ultramicroscopic stage in the life-cycle of the parasite in the peripheral blood during the acute period of infection.

The virulence of the parasites during the various stages of an infection was studied by inoculating fresh birds with blood taken from infected birds during (1) the first and second days of an infection; (2) the third and fourth days; (3) the fifth and sixth days; and (4) the chronic period. The results of experiments on 50 birds are not conclusive but indicate that the virulence is greatest from two to four days after the parasites appear in the blood and is lowest after the parasites are subjected to the host for some time. Virulence in these experiments was measured by the ability of the parasites to invade a new host and by the severity of the infection produced. Virulence was also tested in two series of 16 and 8 birds, respectively, by rapid passage, fresh birds being inoculated on the third day of the infection. No great increase in virulence was obtained and only three transfers were necessary to secure a fixed virus. An increase in virulence to the lethal point does not seem possible.

Among the factors that bring about relapse in malaria are ultra-violet rays. Whitmore has made a beginning in a study of the exact relation of these rays as well as of x-rays to relapse. Data thus far obtained are not conclusive but preliminary studies indicate promising results later.

(2) *Therapeutic Action of Quinin Hydrochlorid and Certain Quinin Derivatives in Experimental Infections with Plasmodium Precox.*—The quinin salts now in general use for the treatment of malaria are recognized as effective agents for the treatment of a malarial attack but as ineffective in ridding the host of all of the parasites. A few parasites remain in the body apparently passing through the regular asexual cycle. Such hosts are carriers from whom mosquitoes may acquire an infection, and are subject to relapses, thus becoming a menace to the community. It has been shown that bird malaria responds to treatment with quinin salts in a way similar to human malaria. Birds may, therefore, be considered favorable material for therapeutic studies. Dr. Boyd, Dr. Shaw and Mr. Hartman have been engaged in this laboratory in an endeavor to determine whether certain quinin derivatives may not be more effective than quinin in ridding the host of parasites. Synthetic quinin derivatives were kindly supplied by Dr. Walter A. Jacobs of the Rockefeller Institute for Medical Research and quinin hydrochlorid was used as a control. The salts were dissolved in normal saline solution and given both by intramuscular injection and orally. The toxic action of the drugs on the host was first determined. It was found that the birds either die or recover in a short time after the injection of the drugs, the symptoms being violent gastric disturbance, muscular weakness and loss of coordination. Examples of the minimum lethal dose and the hemolytic effect on red cells *in vitro* are as follows:

Quinin hydrochlorid,	intramuscular,	4 mg;	per os, 8 mg;	hemolysis,	partial.
Derivative C 74,	"	3.5 mg;	per os, 5 mg;	hemolysis,	slight.
Derivative C 72,	"	1 mg;	per os, 1.5 mg;	hemolysis,	complete.
Derivative C161	"	3.5 mg;	per os, 5 mg;	hemolysis,	partial.

The effects on the parasite *in vitro* were studied next in order to obtain a clue as to which drugs might be expected to be most effective when injected into infected birds. The drugs were dissolved in normal saline then added to infected blood and incubated at 39° C. for 20 minutes. The cells were then washed thoroughly and inoculated into clean birds. Infections were obtained with five quinin derivatives and two controls, the period of incubation being much extended in the case of the derivatives. No infections were obtained with quinin hydrochlorid and three of the quinin derivatives, C74, C72 and C120. The latter

were therefore used for further work. A single dose with derivatives C74, C72 and C120 (one-half of the minimum lethal dose), given one hour before inoculation with 5,000,000 parasites, failed to prevent infection, due presumably to the rapid excretion of the drug. A single dose at an early stage of the infection with quinin hydrochlorid and derivatives C74 and C161, gave a slight retardation in the rise of the infection. Repeated doses given orally, three doses daily at six-hour intervals of one-fourth the minimum lethal dose or six doses daily at two-hour intervals, with quinin hydrochlorid, C74, C72, C120 and C161 showed quinin hydrochlorid to be very efficient against the parasites, in which respect it resembles the effect on human malaria, and to be more efficient than the other drugs used in the experiments. Daily doses for two weeks during the period of chronic infection did not free the birds from parasites. Parasites were present both during and after treatment.

The conclusion to be derived from these studies is that quinin hydrochlorid is more effective than any of the other drugs used. Considerable further progress with drugs has been made, but cannot be reported at the present time.

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OBSERVATIONS ON THE TREATMENT OF MALARIA WITH STOVARSOL*†

By C. C. Bass, M.D.,
New Orleans, La.

Stovarsol (Acetylaminohydroxyphenylarsonic acid) is a synthetic arsenical designed by Levaditi and his co-workers[1] to be administered by mouth and intended at first for use in the treatment of syphilis. It has also been found to be useful in the treatment of amebic dysentery. Its amebacidal properties, first noted by Levaditi and his co-workers, have been confirmed by numerous observers, particularly, in France, by Garin and Lepine,[2] and in this country by Johns and Jamison.[3 4] The fact that this drug has amebacidal properties against the intestinal ameba of amebic dysentery naturally has suggested that it might also have similar properties against the hemameba of malaria, a somewhat similar protozoan parasite.

The first published report of the treatment of malaria with stovarsol was by Valenti and Tomaselli[5] who treated two cases. They reported brilliant results in one case of quartan and one of tertian malaria. In the quartan case they state that "intensive and continued quinin medication proved ineffective." Two attacks were allowed to occur under observation before the treatment with stovarsol was begun. One tablet (0.25 gm.) was given on the first day and two tablets on each of the following ten days. One more attack occurred, after which the patient remained afebrile and parasites disappeared finally after the sixth day. In the tertian case the patient who had remained afebrile under observation for twenty days developed severe clinical attacks with tertian parasites in the blood. After three such attacks he was put on stovarsol, one tablet the first day, two during each of the following three days and one the next, making a total of five days of treatment. One mild attack occurred after the stovarsol treatment was begun, but no more, and the parasites quickly disappeared. The enlarged spleen decreased in size rapidly in both cases.

Marchoux[6] administered stovarsol in 1 gm. doses orally, subcutaneously, intramuscularly or intravenously to 44 persons with malaria, 19 quartan, 13 estivo-autumnal and 12 tertian. In all the tertian cases the parasites and symptoms rapidly disappeared. The other forms were unaffected. Marchoux and Cohen[7] gave stovarsol intravenously to seven general paralytics who had been inoculated with benign tertian malaria. The mature schizonts and gametocytes disappeared in four to six hours and all forms within twenty-four hours.

At the time I offered to present a paper on this subject I intended to treat a number of well selected cases with stovarsol and hoped to have sufficient personal observations to be of use in indicating the value of the drug in

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†Read before National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Nineteenth Annual Meeting, Dallas, Tex., Nov. 9-12, 1925.

malaria. Certain circumstances have limited the number of cases observed to two. The circumstances referred to particularly are the scarcity of suitable available malaria cases and receipt of information which leads to doubt as to the safety of the use of stovarsol on account of possible toxic reactions.

The number of cases of malaria seen in New Orleans has been rapidly decreasing for some time. Those that are seen receive their infection somewhere else and most of the cases are non-residents. For this reason we have not had at our disposal sufficient suitable cases for study. It would seem that the opportunity for the study of malaria on large numbers of cases in New Orleans is passed.

In malaria it frequently occurs that when patients are put to bed on light diet and hospital regimen, the clinical symptoms rapidly improve or disappear. The number of parasites gradually lessens and they also finally disappear. For the results of a treatment being tested to be significant, the conditions must be such as to favor continuation of the disease and not improvement. These conditions which favor improvement and tend to bring about recovery when patients are hospitalized might be responsible for such improvement as occurs and not the drug used.

One of our cases was ideal for the purpose. There was no evidence of any effect of the stovarsol in this case. This patient had been having somewhat irregularly occurring paroxysms during a period of about three months, with occasional intervals of several days during which he had no attacks, probably due to the treatment that he took at these times. His blood showed numerous quartan parasites, both gametocytes and schizonts, including a good many rosettes. He was put on stovarsol, one tablet three times daily, and instructed to continue his usual activities and to eat anything and all that he wanted. The object was to allow the malaria to continue except for such effect as the stovarsol might have. The treatment was continued for four full days, during which his temperature at the time he returned for observation each day was 99.6° before treatment, 101.4°, 103.6°, 102.4°, 103.3°. There was no demonstrable reduction in the number of parasites or recognized changes in them. and the patient was quite ill. On the fifth day he was put on ten grains quinin sulphate three times daily. When next seen, about twenty-four hours after the quinin was started, his temperature was 99.4° and after prolonged search of several blood specimens one parasite was found. The next day his temperature was 98.4° and no parasites could be found.

The symptoms continued unabated and parasites were not reduced by stovarsol treatment for four full days. Both symptoms and parasites were practically controlled in twenty-four hours and completely so in forty-eight hours by treatment with quinin. There was no evidence discovered that the stovarsol had any effect whatever in this case.

The other case was one of tertian malaria due to *Plasmodium vivax*. The patient had been having chills and fever but had taken a few small doses of quinin when he came under observation. He had improved somewhat but still had fever and some parasites. He was kept under observation for four days, during which time he had fever and parasites at the time of observation each day. He was put on stovarsol, one tablet three times daily, and kept under observation. The next day, about twenty-four hours after starting the stovarsol, his temperature was 99.2° and it was extremely difficult to find any parasites. The next day temperature was 98.3° and no parasites could be found. He remained free from symptoms and parasites for five days, when he was lost sight of.

It seems in this case of tertian malaria, stovarsol caused fairly prompt disappearance of parasites and symptoms. Mention should be made of the fact, however, that his temperature had tended to run lower and his parasites to become less numerous before the stovarsol treatment was started. In fact, we debated whether it should be started at the time, feeling apprehensive that the symptoms were about to stop and that spontaneous improvement was occurring. Many cases do improve, and the symptoms and parasites disappear without any treatment whatever. I fear that the case was not well chosen and that the apparent results may be misleading. However, there is a possibility, and I believe we can say strong probability, that the clinical symptoms and parasites were influenced favorably by the stovarsol.

From our observation on these two cases, treated with full doses of stovarsol, we did not find any evidence that it has any effect whatever on the symptoms or parasites in quartan malaria. On the other hand, benign tertian symptoms and parasites disappeared while a patient was under treatment with stovarsol and this may have resulted from the treatment given. Stovarsol in this case of tertian malaria and in other published cases seems to have an effect equal to but by no means superior to that of quinin in controlling the active symptoms and the parasites. It will be interesting to learn from further observations how it may compare with quinin in curing the infection.

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DISCUSSION (Abstract)

Dr. William Krauss, Memphis, Tenn.—Dr. Bass' experience with stovarsol is just what I had expected it to be. This drug came into sudden prominence for the cure of amebiasis. In full doses it may be toxic. One of our staff just saved a dysentery patient by the prompt intravenous injection of sodium thiosulphate. It will be remembered that in 1922 at the Rudolph Virchow Hospital arsphenamin had proved fatal to several patients. It was found that these patients, under treatment for syphilis, had estivo-autumnal malaria. The fatal results were ascribed to the effect of the drug in heavy infection with estivo-autumnal malaria. The consensus of opinion the world over is that arsphenamin is curative of tertian but provocative of estivo-autumnal malaria. This is argued as proof of the specific difference of the two parasites. We think arsphenamin is useful after quinin has been given. Used in this way on about 150 patients last year we had for the first time neither deaths nor known relapses. Stovarsol can be given by mouth and may prove to be useful for after-treatment of malaria.

I recall the history of a case of syphilis with coincident malaria. The patient had a chill just as we were preparing to inject him with the original arsphenamin at the time of its introduction. There were numerous e-a rings. We feared to give quinin and the new drug together, and so we injected him the next day, taking chances that the injection might help the malaria. He had a nasty reaction and on the next day he had a hard chill. Parasites were numerous. I am afraid of arsenicals in untreated malaria.

Dr. Enrique Martinez Carranza, Monterey, N. L., Mexico.—Mercurochrome in the treatment of malaria does not give the results that have been advertised, on account of its reaction. We tried it on several patients in the Military Hospital of Monterrey, and we did not relieve the patients of the malaria infection unless we used quinin in some form with it. My belief it that when a patient does not respond to quinin orally or intravenously in three or four days, he has some other infection that is non-malarial. I have used mercurochrome intravenously with good results in typhoid infections, typhus and some chronic gonorrheal infections. I am afraid to use it in private practice in malaria because malaria can be controlled with quinin and we are not justified in having the patient undergo this reaction when there are other less dangerous methods of obtaining the same results.

AN EXPERIENCE WITH INTENSIVE QUININ TREATMENT UNDER FIELD CONDITIONS*

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Leesburg, Ga.

During the years 1924 and 1925 an experiment was carried on in Terrell County, Georgia, for the purpose of observing the value of quinin in the treatment of chronic malaria. Because there has always been considerable discussion as to the practicability of quinin therapy as a general public health measure, it was felt that such an experiment as is here described might be of some value. The work was initiated in 1924 under the direction of Dr. S. T. Darling and completed in 1925 under the direction of Dr. Mark F. Boyd.

The locality chosen for the experiment is one of high malaria endemicity. The population selected was wholly rural and consisted of negro children between the ages of two and twelve years. The population is shifting in character, inasmuch as there is an extensive migration of the negro families from one plantation to another between the harvest season and the next planting season. Very few of the negroes are landowners. Most of them rent land or raise crops on shares. For this reason it was impossible to make continuous observations on a selected group over two seasons. Instead, the experiment was divided into two sections, one conducted in 1924, the other in 1925.

The first study included a group of seventy-four children with spleens varying in size from those just palpable on deep inspiration to those extending below the costal margin to the umbilicus. Of these children, twenty-eight were used as controls and forty-six were treated. Every effort was made to have equal numbers of each spleen size in both groups and to have controls and treated cases in the same h eholds. In this way the factors of nutritio xposure to reinfection, etc., were equalized so far as possible. For the second part of the experiment, carried out in 1925, sixty-nine children were chosen. Of these, fifteen were used as controls and fifty-four were given treatment. Precautions were taken to obtain distribution of cases as was done in 1924.

The method of treatment was based on the

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*Read before the National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Nineteenth Annual Meeting, Dallas, Tex., Nov. 9-12, 1925.

so-called Bass, or standard, treatment recommended by the National Malaria Committee. The quinin used was Powers-Weightman-Rosengarten's quinin sulphate taken from the original containers. It was administered in syrup of yerba santa. Two suspensions were made under the direct supervision of a physician from the station, who personally checked all weighing and measuring operations. One suspension contained four grains of quinin to the dram and the other six grains to the dram. With this combination any dose given in the table below could be accurately measured. A gallon of each syrup was sufficient to last about two weeks. To prevent souring, no more than this small quantity was made at one time. The syrup was thoroughly shaken before the administration of each dose. The dispenser had a roll book in which he kept a record of every dose for each child. He visited each child every day and with his own hand measured and administered the doses. Only in this way could there be absolute assurance that every child ingested his daily dose. The doses used were as follows:

Age of Child	Dose of Quinin
2 years	2 grains
3 to 4 years	3 grains
5 to 7 years	4 grains
8 to 10 years	6 grains
11 to 14 years	8 grains

In the 1924 experiment the treated cases were given quinin for ten weeks. In 1925, treatment was continued for twelve weeks. In the latter year the matter of reduced dosage was given consideration, and the treatment group was divided. In one section there were twenty-five children who were given the customary daily dosage. In the second section of twenty-eight children the regular dose was given on alternate days so that the total amount of quinin administered was one-half that received by the children treated daily.

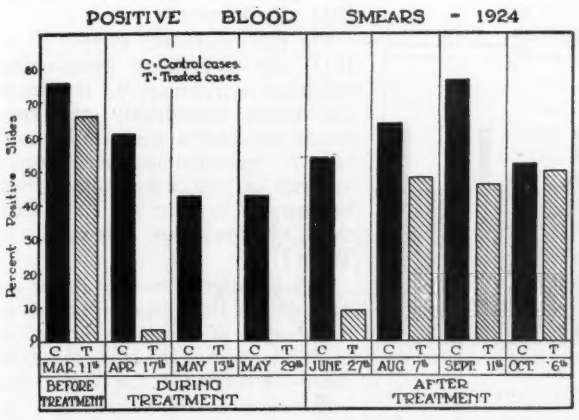
Before passing to a consideration of the data furnished by the experiment it is necessary to describe the general conditions under which the two phases of the experiment were carried on, how these differed in the two years, and the effect of these differences on the results of the study.

The year 1924 was slightly subnormal in respect to precipitation. It was not considered to be normally severe so far as malaria rates were concerned. However, there was plentiful breeding of *Anopheles quadrimaculatus,* and although there was doubtless a reduction in the amount of active malaria, there was still no paucity of febrile attacks. Only two cases of hemoglobinuric fever came to the attention of Dr. Darling in 1924, while in the previous year there had been several. As a result of the relatively dry season excellent crops of cotton and peanuts were harvested by the negroes. As these crops are the two chief sources of revenue in this district, the good harvests were followed by a general improvement in the physical condition of the negroes. Better food supplies were generally available.

In January, 1925, there was extremely heavy rainfall. The total fall within ten days was almost one-third the normal yearly precipitation. However, after the flood the rainfall suddenly declined and remained subnormal up to the time of writing (early October). This resulted in an unprecedented drought. Coincident with the drought nearly all the customary breeding places of anopheles in this area disappeared. By the time *Anopheles quadrimaculatus* would have begun to appear in considerable numbers in a normal year, in 1925 there were none or only an insignificant number to be found. Therefore transmission of malaria plasmodia was obviously reduced. This stroke of fortune combined with the factors for physical good before mentioned, was manifested in a very marked reduction in the amount of active malaria. No cases of blackwater fever were seen in 1925. Among the children in the control group there was a tendency to a reduction of the splenic mass and a decline in the blood index. This factor is to be considered when evaluating the effect of quinin on the treated groups in the 1925 experiment. These cases show the combined results of no transmission and quinin therapy. For this reason they do not furnish as valuable a measure of the effects of quinin as do the cases treated in 1924, a year in which malaria transmission was far more prevalent and in which rainfall and mosquito breeding, though not normal, were more nearly so than in 1925.

The material for the two years will be recorded separately in the tabulation of data. In both years a preliminary examination of the children was made and treatment was thereupon begun and continued for the specified time. All children were re-examined at intervals of four weeks during treatment and for three or four months after its discontinuance, or as long as conditions of crop harvests and movement of the population warranted. At these examinations a thin blood film was taken

CHART I



from each child, a hemoglobin reading was made, and the spleen was palpated. Blood films were stained with Hasting's stain and examined for twenty minutes before being designated as negative. Hemoglobin estimations were made with the Dare instrument and always by the same individual, thus eliminating error as much as possible. For purposes of comparison arbitrary weights have been given to the various spleen sizes, based on Bean's measurements of children. These are as follows:

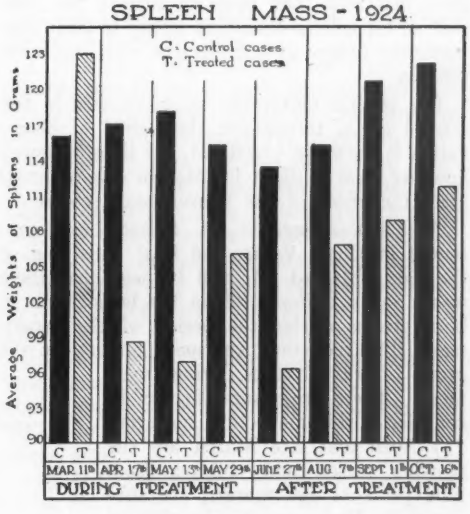
	Grams
Negative	75
Palpable on inspiration	90
Palpable	105
Palpable 1 finger's breadth below costal margin	125
Palpable 2 finger's breadth below costal margin	150
Palpable 3 finger's breadth below costal margin	180
Palpable to umbilicus	220

In the 1924 experiment the treatment was begun on March 11 and discontinued on May 29. The last examination was made on October 16. The tabulated data for the experiment follow:

Of particular interest is the fact, illustrated by Chart 1, that the dosage of quinin was sufficient to clear the peripheral blood stream of parasites, and to maintain this state as long as the drug was used. However, on the termination of treatment parasites at once reappeared in the peripheral blood stream and within three months almost reached pre-treatment level. The fall in the blood index of the control group during the spring and before the onset of the malaria season is noteworthy. With the appearance of increasing numbers of *Anopheles quadrimaculatus* there was a uniform rise in the blood index of both groups.

Chart II shows that the reduction in the spleen mass under treatment was quite distinct, but that as soon as treatment was stopped it exhibited a marked tendency to increase in size. The pre-treatment level of enlargement, however, was not reached within the period of observation.

CHART II



WEIGHTS GIVEN TO SPLEENS

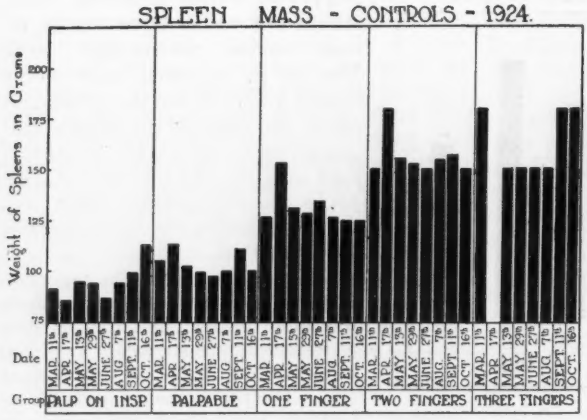
NEG. 75	2PB. 150
P.I. 90	3PB. 180
PALP. 105	UMB. 220
1PB. 125	

TABLE I—RESULTS OF MALARIA STUDIES IN 1924, SEVENTY-FOUR CASES*

Date of Examination	Per Cent of positive bloods		Average Spleen weights (estimated)		Average Per Cent hemoglobin	
	Controls	Treated	Controls	Treated	Controls	Treated
March 11	78	66	116.0	123.0	82.9	81.6
April 17	61	3	117.0	98.6	79.9	83.3
May 13	43	0	118.2	96.8	77.6	81.5
May 29	43	0	115.2	94.2	76.4	80.0
June 27	54	9	113.2	96.2	76.7	78.5
August 7	64	48	115.2	106.6	76.6	75.7
September 11	77	46	120.6	108.8	74.8	77.3
October 16	52	50	122.4	111.4	69.9	70.4

*46 treated, 28 controls.

CHART III



From Chart IV it will be seen that the spleens of larger size responded to the treatment far more markedly than those of smaller size, but that all the spleens tended to return to their pre-treatment degree of enlargement with the same rapidity.

The general uniformity of spleen size in the control group throughout the period of observation is shown in Chart III. It is to be noted however, that a slight increase in size occurred after the onset of the transmission season.

The figures secured on hemoglobins, presented in Chart V, are the least satisfying of the data obtained. It will be seen that there was a fairly uniform fall in the hemoglobin of both groups during the period of the experiment. The reduction was more gradual in the group of treated cases during treatment. There are several factors to consider in this connection, however: (1) April and late March are the plowing season and children from nine years of age upward are subjected to the strenuous exertion of this operation. (2) September and October are the harvest season for cotton and peanuts, and the children are all in the fields at this time. Perhaps no season subjects the children to such severe physical fatigue as does the peanut harvest. (3) At times quinin seems to have the power of reducing the hemoglobin, and this may in part explain the reduction which occurred in the treated cases. As will be seen later, however, this effect was not observed during the 1925 experiment.

For the experiment carried on in 1925, the preliminary examination was made on February 9. Treatment was begun immediately and continued for twelve weeks, i.e., until May 7. Examinations were made at intervals of twenty-eight days, from February 9 to July 30. The data thus obtained are recorded in Table II.

A point of great interest in the results of the 1925 experiment lies in the behavior of the control group. In Chart VI, showing the blood index, we observe a decline in the level at the termination of the experiment. In 1924, it is to be recalled, the index of the control group rose through the late summer and fall. The ability of the standard treatment to clear the peripheral blood stream of parasites is again well shown. It is interesting to note that the reduced dosage failed to accomplish this result.

In Chart VII we see that the average spleen weight of the 1925 control group shows a very marked tendency to decrease, whereas in 1924 it exhibited an equally definite tendency to increase, particularly in the late summer. Chart VIII shows that in 1925 the reduction of the spleen mass occurred in all the spleen groups of the control cases, and was most apparent after the March examination.

Apparently the effect of quinin in the treated cases, as shown by Charts IX and X, is somewhat to hasten the process that is taking place

CHART IV

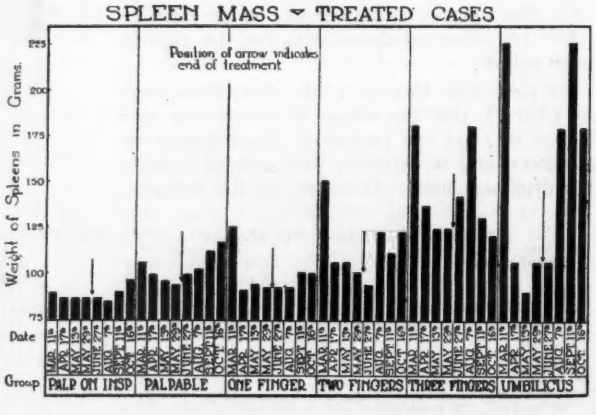
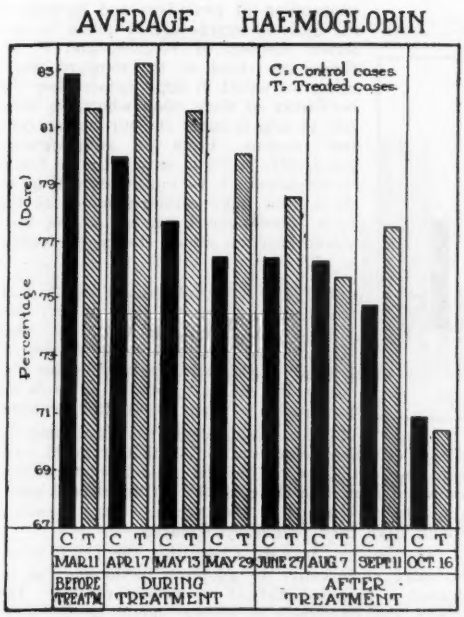


CHART V



in the untreated cases. This acceleration is most obvious in the group given daily treatment.

Chart XI shows that in 1925 the hemoglobin of all cases, instead of exhibiting the uniform tendency to fall, as was observed in 1924, remained practically constant throughout the entire period of observation. There was no significant difference between the course of the hemoglobin curves in the treated and the control cases.

Considering the differences between the two treated groups in 1925 we see a definite tendency to reduction of the parasites and of the spleen mass in the children given treatment on alternate days. However, the blood streams of this group were never cleared completely of plasmodia as occurred in the daily treated cases, nor were the spleens reduced as much as in the latter group. The reduction in parasites and spleen mass seems roughly proportional to the amount of quinin taken.

The spleen reduction in the daily treatment groups of the two years shows an interesting contrast: in the 1924 group the spleens tended to return to their pre-treatment status within two or three months after treatment was stopped, while in 1925 the reduction attained under treatment was maintained practically at a level after the cessation of treatment. The same contrast may be seen in the control groups as well: reduction in 1924 was slight in midsummer and the gain was lost in late summer, while in 1925 reduction continued throughout the period of observation.

In contrasting the differences of the two years the following brief summary is useful:

CONCLUSIONS

It seems reasonable, on the basis of the experience gained in these two series of treatments, to conclude that:

(1) In years when there is not more than an average amount of malaria transmission in an endemic region, the standard treatment will eliminate parasites from the peripheral blood stream and prevent relapse during the period of treatment. It will also cause a marked reduction in the spleen mass. These conditions prevail only so long as treatment is continued.

(2) Upon discontinuing treatment the peripheral blood very rapidly becomes reinvaded by the parasites and the spleens increase in size.

(3) Very little is gained by treatment in a year when malaria transmission is naturally reduced, except a slight acceleration in the clearing of the blood stream and in the reduction of spleen size.

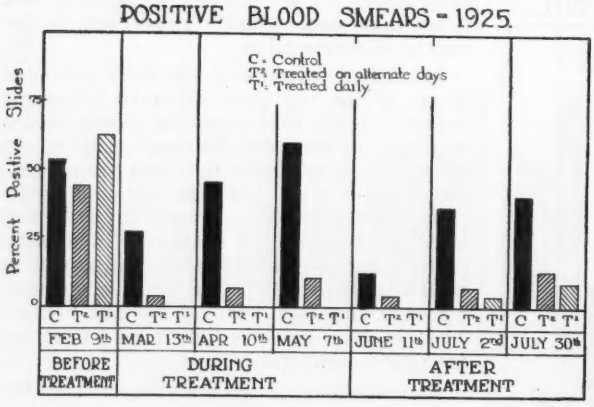
(4) Half the amount of quinin recommended by the standard treatment will not clear the

TABLE II.—RESULTS OF MALARIA STUDIES IN 1925, SIXTY-NINE CASES*

Date of Examination	Per Cent of Positive Bloods			Average Spleen Weights (Estimated)			Average Per Cent Hemoglobin		
	Controls	Treated		Controls	Treated		Controls	Treated	
		Alternate Days	Daily		Alternate Days	Daily		Alternate Days	Daily
February 9	53	44	62	106	112	117	77	76	75
March 13	27	4	0	124	99	105	77	79	77
April 10	46	7	0	110	97	99	76	76	76
May 7	60	11	0	109	94	95	79	76	77
June 4	13	4	0	104	95	87	73	76	73
July 2	36	7	4	100	95	90	77	79	77
July 30	40	13	9	97	93	90	Not taken		

*15 controls, 26 cases treated daily, 28 cases treated on alternate days.

CHART VI



peripheral blood stream of plasmodia. In general the larger dosage produces a greater reduction in the spleen size than the smaller doses.

(5) In this experiment the hemoglobin estimation did not prove of practical value in determining improvement in children treated with quinin for chronic malaria.

(6) The use of the standard treatment as recommended is of definite benefit during its administration, but it has been shown insufficient to effect a cure in chronic cases. To be effectively administered the method demands strict and expensive supervision. Therefore the experiment would seem to indicate that the standard treatment cannot be recommended as a public health measure.

DISCUSSION (Abstract)

Dr. Roy K. Flannagan, Richmond, Va.—I am not prepared to challenge the scientific accuracy of data presented by Dr. Collins. I do, however, wish to say in connection with his conclusion that this body should go on record as opposed to the standard quinin treatment for malaria that I hope that no positive action in line with his viewpoint will be taken by this body at this time. After full consideration, and if I mistake not on recommendation of the National Malaria Committee, the Virginia State Board of Health has thoroughly advertised the value of the standard treatment. While we do not wish to put ourselves in the position of saying that we will not change a course when that course is found to be out of line with the best procedure, there are serious obstacles in the way of our reversing our position in regard to the standard treatment at this time. We have secured the cooperation of physicians and laymen to the more systematic use of quinin in malarious districts of Virginia, and if we threw any cloud on the standard treatment, we would in large measure lose the confidence of those upon whom we must rely to help us carry out our malaria control program. From an administrative standpoint, at least, such a course would be disastrous. If we must back out, let us do it after fuller consideration of all the facts. Personally I am not as yet convinced that we should change our course at all.

Dr. John A. Ferrell, New York, N. Y.—Observations along the lines of Dr. Collins' studies should be made by other scientists under varying conditions and reported. Evidence accumulated in this way will in the end guide administrators in the formulation of plans for control measures.

If Dr. Collins could have scheduled the period of quinin administration so that it might have continued until frost, the element of doubt that has been expressed relative to the possibility of unobserved quadrimaculatus reinfecting the persons being studied, would have been practically removed.

The National Malaria Committee should, I think, be quite conservative in adopting resolutions for or against a proposed method of malaria control. The values and limitations of quinin should be definitely determined by qualified investigators, and their work should be checked up by competent workers. When this is done and the conclusions are published, the procedures that stand the test will be adopted by official health organizations.

Dr. T. H. D. Griffitts, U. S. P. H. S., Montgomery, Ala.—The results in Georgia follow closely those we had in Alabama a year previously, which were published in the Public Health Reports.

CHART VII

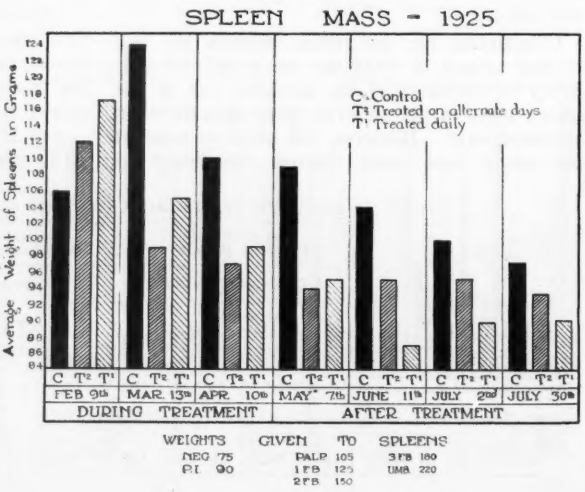
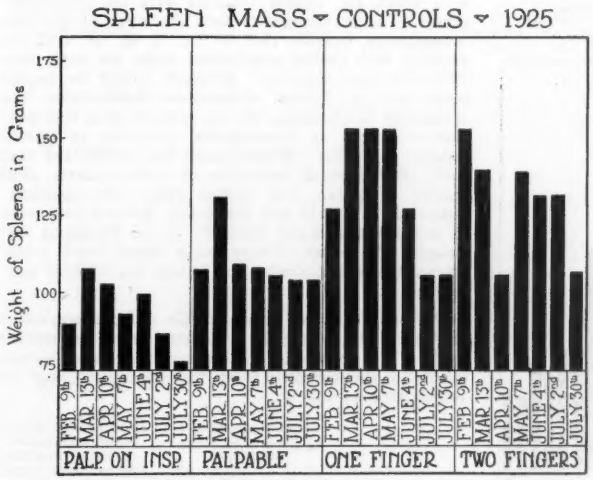


CHART VIII



The standard treatment given under constant supervision during the sixty day period and to a generally poorly nourished series of cases, failed in 25 per cent of cases to rid the patients of parasites.

The extravagant claims for the standard treatment, offered too promiscuously by non-medical health workers, have tended to over-popularize it, making the treatment more an original package process of self-medication, rather than of sufficient importance to demand supervision and direction by the physician. Every case of malaria infection should be considered serious enough to require treatment by a physician. Feeding, cure of concomitant hookworm disease, and general care are almost as important in the treatment as quininization. Of prime importance is the thorough teaching of malaria in all of its phases in the medical schools.

Dr. David H. Keller, Pineville, La.—No community can afford to treat malaria and ignore the intensive use of quinin. At the Central Louisiana State Hospital, where Dr. Thomas has been Superintendent for many years, the necessity of quinin has diminished consistently, but this we feel is due to the fact that we are handling the malaria problem from every standpoint. Dr. Thomas says that, whereas he used to use pounds of quinin a year, he now uses ounces. At the same time the entire hospital plantation has been thoroughly ditched, and large portions have been oiled. Many of our buildings have been screened and every proven case of malaria has been given the routine quinin treatment as prescribed by the State Board of Health.

We have in this hospital a full time pathologist and every case of fever has an examination to determine the presence or absence of malaria parasites. If the parasite is absent and the symptoms of malaria are present, we treat them anyway.

We have always in the hospital a certain number of cases of malaria among the recently admitted, but each year we have fewer and fewer cases of malaria to report, and it is my opinion that it is very largely due to the frequent and persistent use of quinin.

Dr. Wm. Krauss, Memphis, Tenn.—There are four objectives in giving quinin. It is well to consider which is the most important in a given case. We give quinin for prevention, for the fever, for eradication of gametes and to prevent relapse. As to the first, quinin in reasonable doses has not been satisfactory for the prevention of malaria. Judging from the studies of Yorke and Macfie, quinin taken immediately after exposure does not prevent malaria. In our territory prophylactic quinin would be unjustifiable. Gamete destruction and relapse prevention can be considered together. Gametes will not survive if their production is stopped with large doses of quinin given continuously for a month, but with the relapse they recur. Just what per cent would relapse under such conditions?

Our studies in Memphis gave results quite parallel with those of Dr. Collins. We followed up a group of cases for the better part of a year, but the number we were able to locate diminished to such an extent that we did not complete the sutdy. Those who continued their quinin more or less regularly fared somewhat better than those who did not. The difference was not very striking. Their economic status seemed to play a more important role than their faithfulness in taking quinin. The most we can say is that the more regularly the relapsing patients keep up their quinin, the more days they will be able to be on their feet. In our follow-up work we examined the blood periodically. We had to rely on the statement of the patient as to faithfulness in carrying out our treatment. After all, this is what you have to expect in practice. You cannot force any considerable

CHART IX

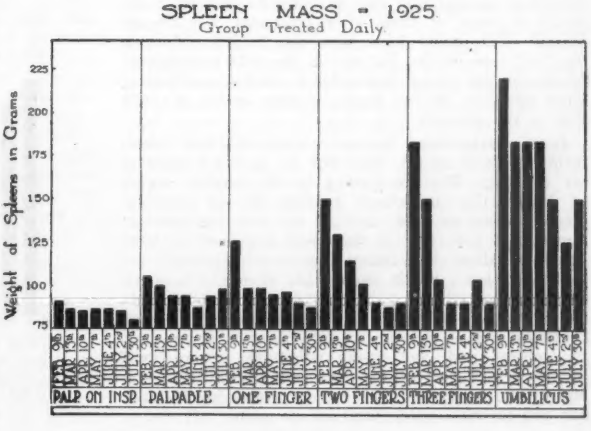
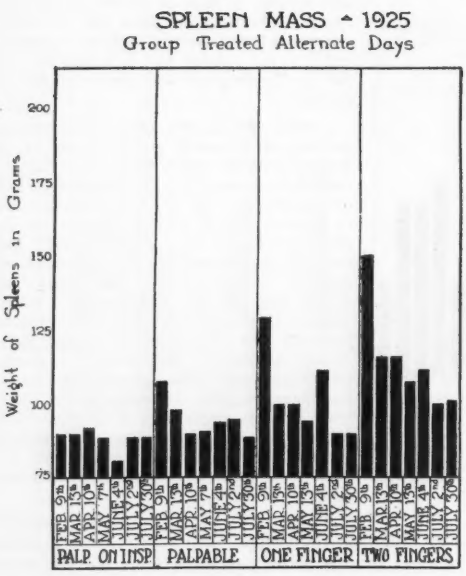


CHART X



number of persons to take quinin continuously, and the results scarcely justify the attempt.

Dr. M. A. Fort, Bainbridge, Ga.—I found enlarged spleens in the southeastern corner of Terrell County, Georgia, and wanted to try this experiment, but was unable to do so because I had no fund with which to finance it. I asked Dr. Darling at the International Health Board station, 15 miles away, to undertake it.

I was much interested to see the treated children cease having chills and fever, work better, feel better, eat better, parasites disappear from the peripheral blood, and the spleens show a marked decrease in size, while the reverse was true of the controls. But I was disappointed that few of the spleens became absolutely normal, and that parasites reappeared in the blood of some of them after treatment was discontinued. This might have been due to reinfections in the 1924 experiments, but not in the 1925 experiments, because it was almost impossible to find a quadrimaculatus mosquito in any home in that section in 1925, due to the drought.

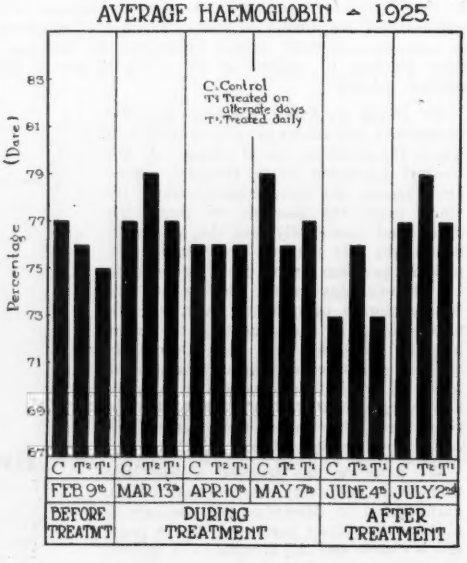
I am disappointed because quinin, the only treatment we have as yet, does not do as much good as we thought. We are finding in the nearby county of Miller, that in schools running 60 per cent enlarged spleens in 1924, only 30 per cent are now enlarged, and very few of these had any fever in 1925. Some of these had taken standard treatment, but some had not. So it seems that if reinfections are prevented, symptoms, large spleens, and parasites tend to disappear, all of which are hastened by the long continued use of quinin. In other words, if you stop reinfections, and give quinin religiously, malaria will be cured. If not all the first season, then the second or the third, the cases rapidly decreasing in number and severity, until there are no more.

Dr. K. F. Maxcy, U. S. P. H. S., Montgomery, Ala.—I wish to say a word in behalf of quinin. The results which Dr. Collins obtained with this population group in south Georgia confirm the work of previous investigators, notably that of Dr. T. H. D. Griffitts, working with similar populations under the same conditions of mass infection. Although during the second season of Dr. Collins' observations transmission was apparently in abeyance, we can conceive that this population was in an impoverished condition as regards natural antibodies. Recent work has emphasized that early treated single infections of acute malaria yield readily to quinin, and indeed, often cure spontaneously. In a lightly and transiently infected area such as is sometimes found especially in the Piedmont sections of the South, a very much better result might attend the administration of quinin for control purposes.

Dr. M. F. Boyd, Leesburg, Ga.—The observations on these children may be considered from yet another angle. The results of the examinations made subsequent to the completion of the treatments may be summarized as follows:

Year 1924—Class	No.	Individuals whose blood was always negative: Spleen Dim.	Spleen Stat.	Spleen Fluct.	Individuals whose blood was subsequently positive one or more times: Spleen Dim.	Spleen Stat.	Spleen Fluct.
Control	28	1	0	0	4	2	21
Treated Daily	45	1	1	9	3	8	23
1925—Control	15	3	2	0	3	5	2
Treated Daily	24	5	9	7	2	0	1
Treated Every Other Day	27	3	12	8	2	1	1

CHART XI



				1924	1925
Precipitation				Slightly subnormal	Very markedly subnormal
Breeding				Abundant	Very scarce
Transmission				Plentiful	None
				Slight fall followed by rise	Continued gradual fall
Changes in Spleen Mass	Treated Cases	Controls: Daily:	During	Marked decrease in size	Rapid decrease
			After	Gradual increase in size	Continued gradual decrease
		Alternate Days	During		Gradual decrease in size
			After		Gradual decrease in size
Changes in Blood Index	Treated Cases	Controls: Daily:	During	Slight reduction	Slight reduction
			After	Reduced from 66 to 0	Reduced from 62 to 0
				Increase from 0 to 50	Increase from 0 to 9
		Alternate Days	During		Reduced from 44 to 11
			After		Increased from 11 to 13
Changes in Hemoglobin	Treated Cases	Controls: Daily:	During	Gradual decline	Stationary
			After	Gradual decline	Slight increase
				Gradual decline	Slight increase
		Alternate Days	During		Slight increase
			After		Slight increase

While the subsequent examinations were made only at monthly intervals, it may be considered that those whose blood was consistently negative, and whose spleens were either stable or diminished in size during the three or four months period, present some definite indication of cure. Fluctuations in the size of the spleen are suggestive of a latent uncured infection, regardless of the result of the blood examination. On this basis we have

1924—Controls	1 or	3.5 per cent
Treated	2 or	4.4 per cent
1925—Controls	5 or	33.3 per cent
Treated Daily	14 or	58.3 per cent
Treated Every Other Day	15 or	55.7 per cent

as showing definite evidence pointing toward cure. The degree of difference between the per cent of cures in the treated as compared with the controls represents what may be fairly credited to the effect of the treatments, or in 1924, 0.9 per cent, and in 1925, 25 and 22.5 per cent. There was considerable anopheline density in 1924, while anophelines were scarce in 1925. The apparent lower cure rate for 1924 probably may be ascribed to reinfections, while the rate of 22 to 25 for 1925 represents what may be expected in the absence of reinfection. Thus these observations essentially confirm the contention of Acton, namely, that a cure rate of approximately 25 per cent may be expected from a single course of treatment. Since the courses lasted 25 and 50 per cent longer than the period of the standard, it does not appear likely that 90 per cent of cures may be expected from the standard treatment.

Dr. Collins (closing).—I trust that the meeting has not felt that my object has been to discard forever the further use of the standard treatment; that has been farthest from my mind. The method appears to me to have its uses and there are times when its application is most desirable. One of the chief of these occasions is in the handling of epidemics. My contention, however, is that the method, according to our data, may have its limitations. We had an example of this in the epidemic of 1924 at Gantt when, despite our most strenuous efforts to get the populace to take the standard treatment, which was furnished them gratis, we estimated that only 5 to 10 per cent of the people who were urged to take the treatment and who contracted to take it, actually completed the course. It cannot be hoped that under these conditions the carrier rate is appreciably reduced. It was in order to approximate the effect of this reduced dosage so commonly met in practice that we provided for our experimental group treated with reduced dosage. That the carriers were not disposed of is obvious from the chart showing the persistence of a positive blood index throughout treatment. At Gantt, in 1925, there was a much more satisfactory response to the use of the standard treatment. Education and bitter experience had their share in attaining this improvement.

Regarding the question of transmission raised by Dr. Bass, I had best explain circumstances and allow you to draw your own conclusions. We had at Leesburg this past season the unique experience of not only having to hunt for Anopheles mosquitoes, but of being unable to find them. At our routine stations, established for the the purpose of making large and varied catches, there were weeks at a time when we secured almost no anopheles. This applies not only to *Anopheles quadrimaculatus*, but to the other two species as well. Of all three, however, *Anopheles quadrimaculatus* was the most rare at the times we could catch any at all, i.e., during the very early part of the season. During the season when we would normally expect to have much malaria and many *Anopheles quadrimaculatus* we were catching none of this species and very few specimens of the other species. Dr. Griffitt's catches of 0.6 *Anopheles quadrimaculatus* per house with positive transmission is remarkable; but we failed to find any fraction of an *Anopheles quadrimaculatus* per house and this in the midst of the season when normally the transmission would have been at its height. It appears to me that under such circumstances as these, trans-

mission could be safely excluded as a cause of the few cases of fever which were encountered in the area under observation.

THE SIGNIFICANCE OF THE DATA COLLECTED BY SPLENIC SURVEYS*

By MARK F. BOYD, M.D.,
International Health Board,
Leesburg, Ga.

(1) *Areas Studied.*—The data summarized in this paper were collected during the course of a field study continuously carried on for three years in four small towns in the coastal lowlands of the state of Rio de Janeiro, Brazil. The studies were prosecuted with the active interest and cooperation of the Brazilian National Health Department and that of the State of Rio de Janeiro.

The villages were small, their aggregate population being about 3,300, and ranging from about 250 for the smallest to 2,200 for the largest. In the course of these studies six surveys were made of their populations and during the course of each from 50 to 70 per cent of all the inhabitants were examined. The six surveys had the relation indicated to fever seasons of the period covered, viz:

	When made		Relation to malaria
Surveys	Month	Year	Season
I	July-Aug.	1922	Post season
II	Jan.-Feb.	1923	Pre season
III	July-Aug.	1923	Post season
IV	Jan.-Feb.	1924	Pre season
V	July-Aug.	1924	Post season
VI	April-May	1925	Mid season

Thus it is seen that three surveys (I, III, V) reveal post-seasonal conditions, and two (II, IV) pre-seasonal conditions, and the last is a mid-season index. The latter was purposely not synchronized with the others in order that a more severe test might be made of the results of control work, as three of the villages were the seat of demonstration control work for the last two years of the period.

Our constant aim was to examine as large a proportion of the inhabitants as possible, including all ages and races, and individuals of both sexes. Some examinations were made with the subject recumbent, but the majority were examined while standing erect. The varying conditions encountered prevented a uniformity in the procedure followed. Spleens were examined by palpation, as a rule confirming the results of the palpation by percussion in the case of those either negative or showing slight enlargement.

In the expression of the results an effort was made to employ a classification that would roughly express the degree of enlargement in relation to stature. It is obvious that a two finger spleen in a child of three is relatively much larger than a two finger spleen in a case of an adult, and that any classification based on units of length will be unsatisfactory from this standpoint. In order to avoid this difficulty, and to simplify the groups used, the following classification was employed:

Spleen 0 not palpable.

Spleen 1 enlarged, extends to the costal margin.

Spleen 2 enlarged, margin between costal margin and a point half way to the umbilicus.

Spleen 3 enlarged, margin between a point half way to the umbilicus and the umbilicus.

Spleen 4 enlarged, margin below the umbilicus.

A survey that does not take into consideration the volume of each spleen examined neglects one of the most useful sources of information a survey may be expected to yield.

(2) *Some Observations on Malaria Splenomegaly.*—The data collected in the course of these examinations are so extensive that a detailed presentation at the moment is not possible, and I shall limit the consideration to a few of the most important facts elicited.

From the standpoint of rates, the four villages are dissimilar, representing two different groups, as shown below.

TABLE I—Crude spleen rates

Group	Village	I	II	III	IV	V	*	VI
A	Sant' Anna	75.9	85.4	71.6	66.6	76.4	‖	74.2
	Porto das Caixas	78.2	86.	85.4	71.1	60.7	‖	58.2
	Itamby	72.5	76.8	75.2	77.1	72.7	‖	47.
B	Mage	6.7	12.	5.3	2.	2.9		**

*Vertical double line separates pre- from post-control examination.

**Data not yet available.

The first group is characterized by very high rates, and the second by very low. The first are areas of high endemicity, the second of low endemicity, but, as our observations showed, subject to occasional epidemics of malaria. From the standpoint of age, the high spleen rates noted in those above 15 years of age are striking, though at this point a diminution of the number showing parasites is noticeable.

*Read before National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Nineteenth Annual Meeting, Dallas, Tex., Nov. 9-12, 1925.

This uniformity in specific rates is noticed in both areas of high and low endemicity. No especial difference was noted in different races.

The mean splenic volume during this period has fluctuated as follows:

TABLE II.—Classification of the Average Enlarged Spleen, and of the Average Spleen.

I—Average Enlarged Spleen.

Group Village	I	II	III	IV	V	VI
A Sant' Anna	1.72	1.29	1.45	1.62	1.71	1.82
Portas das Caixas	1.35	1.29	1.66	1.41	1.52	1.68
Itamby	1.41	1.20	1.68	1.36	1.50	1.4
B Mage	1.10	1.06	1.66	1.24	1.33	*

II—Average Spleen.

A Sant' Anna	1.31	1.10	1.04	1.08	1.29	1.35
Porto das Caixas	1.06	1.10	1.42	.99	.92	.98
Itamby	1.02	.92	1.26	1.06	1.09	.6
B Mage	.07	.13	.09	.02	.04	*

*Data not yet available.

Note: Mage suffered severely from epidemic malaria in 1922. The first survey data at that place reflect this condition. Epidemic of malaria in Sant' Anna, 1924.

While the crude spleen rates are of value in estimating the tangible results from malaria control, the supplemental information obtained from a study of the fluctuations in splenic volume has great corroborative value, as shown in Table II.

The determination of the average spleen is a more useful procedure than the determination of the average enlarged spleen. The most useful information would be obtained if we possessed tables giving the weight of the normal spleen at different ages, and the probable weights of enlarged spleens projecting different distances into the abdominal cavity at different ages. Lacking these data the use of weighted averages as here employed is the best means of bringing out these fluctuations. Some attempt has been made by Christophers, and by Darling to employ estimated weight in the case of spleens of children, but much essential data necessary to the accurate employment of the latter procedure is still lacking.

Another useful method to bring out the diminution of volume resulting from non-transmission, is afforded by a study of the changes in splenic volume among those individuals who have been examined successively at two consecutive surveys.

The observations on which this table is based show that in most individuals malarial splenomegaly does not represent a fixed enlargement of the organ, but that in a period of six months, providing the spleen did not previously extend below the umbilicus, its enlargement may subside or become markedly reduced, remain stationary or undergo a still further increase. It was never noted that spleens extending below the umbilicus could reduce in this period to anything approaching normal size.

It does not appear that a marked influence on the prevailing degrees of splenomegaly can be effected during the first year of effective anti-larval operations, except when these are supplemented by the intensive treatment with quinin of a large proportion of those infected. This was done in 1923-1924 in Porto das Caixas and Mage (where anti-larval work was simultaneously carried on) and at Sant' Anna as the sole measure during that season.

Mention should be made of the great value of the geographic localization of splenomegaly and of its degree, as a method of corroborating the field observations made to determine the important producing areas of the transmitting anophelines.

(3) *Relation to the Species of Malaria Parasites.*—A study of the relation of the size of the spleen to the species of parasite encountered brings out some interesting information. In the course of the first five surveys, 10,944 combined examinations of blood and spleen were made. These may be summarized as follows:

In course of all examinations made, only 13.6 per cent of individuals with spleens of normal size were harboring *Plasmodium vivax*, and only 2.7 per cent had *Plasmodium falciparum*. A progressive increase in the incidence of *Plasmodium vivax* is noted as the size of the spleen

TABLE III—Percentages showing changes in splenic volume in those consecutively examined.

	Period between surveys.																	
	I - II			II - III			III - IV			IV - V			V - VI					
A	Sta.	Dim.	Enl.	Sta.	Dim.	Enl.	Sta.	Dim.	Enl.	Sta.	Dim.	Enl.	Sta.	Dim.	Enl.			
Sant' Anna	35.	44.4	20.4	42.8	30.1	27.	53.2	28.1	18.7	30.5	18.3	51.2	45.4	22.6	32.			
Porto das Caixas	56.5	17.6	25.9	51.7	16.7	31.6	58.3	33.3	8.3	40.3	34.2	25.4	43.2	29.5	27.3			
Itamby	51.7	22.1	26.2	54.8	11.8	33.3	46.2	31.3	22.5	44.9	23.8	31.3	29.6	46.7	23.7			
B Mage	82.8	5.1	12.1	83.5	11.4	5.1	92.7	5.9	1.3	96.7	1.4	1.8			*			

*Data not yet available.

TABLE IV: Relation between the Size of Spleen and the Species of Parasite Encountered in the Blood, Excluding Mixed Infections.

	Class of spleens				
	0	1	2	3	4
A. Highly endemic areas					
No. Spleens	884	2046	629	245	96
No. with P. Vivax	117	450	161	84	31
Per cent with Vivax	20.	22.	25.6	34.3	32.3
No. with P. falci.	43	100	38	21	3
Per cent P. falci.	4.9	4.9	6.1	8.6	3.1
B. Mage, low endemicity					
No. spleens	5703	272	69	0	0
No. with P. vivax	705	64	9	0	0
Per cent with P. vivax	12.4	23.5	13.	0	0
No. with P. falci.	134	10	0	0	0
Per cent with P. falci.	2.4	3.7	0	0	0

increases, though a slight decrease is noted in those where spleens extend beyond the umbilicus as compared with the next smaller class. *Plasmodium falciparum* infections do not show such a close correspondence to the size of the spleen, and this parasite is less likely to be found in individuals with very large spleens than in those without splenomegaly.

During epidemic periods a much larger proportion of persons with normal as well as with large spleens are found to harbor *Plasmodium falciparum*. Where the endemicity is high, the proportion of persons with negative spleens who show parasites is higher than in areas of low endemicity.

(4) *Relation to the Incidence of Fever.*—Another interesting relationship exists between the size of the spleen and the incidence of fever. Monthly visits were made to all houses to elicit the incidence of fever during the month, and the fever data are probably more complete than is usually noted. The monthly fever rates for Sant' Anna for 1922-1923, classified according to size of spleens at the midyear period are given in Table V, as being typical. It is to be noted:

(1) That the incidence of fever in this group tends to vary directly as the size of the spleen.

(2) That those presenting slight degree of splenic enlargement show the most constant monthly incidence of fever.

(3) But the early incidence of the season tends to be proportionately greatest among the possessors of the larger spleens, (while the fever late in the season is more common in those who had small or negative spleens).

(4) The highest incidence of fever is among those who have class 3 spleens, the possessors of the largest spleens (4) suffer less from fever. This is parallel to the incidence of parasites.

SUMMARY

(1) The determination of spleen indices or rates is the quickest and simplest method of ascertaining the extent of malaria infection in a community.

(2) Unless the work is done in an area whose endemicity has been determined, individuals of all ages should be examined.

(3) When properly analyzed, these data permit one to judge the degree of endemicity that has recently prevailed.

(4) Splenic data also serve well as criteria of the results obtained by control work. The use of rates should be supplemented by expressions illustrating the fluctuations in splenic volume.

(5) Splenomegaly is more closely a measure of the incidence of infections with *Plasmodium vivax* than with *Plasmodium falciparum*.

(6) Individuals with very large spleens possess a noticeable resistance as compared with those having moderate degrees of enlargement.

(7) The determination of splenomegaly affords the simplest means of determining those in most need of intensive treatment of quinin.

DISCUSSION (Abstract)

Dr. M. A. Fort, Bainbridge, Ga.—The two greatest aids to a malaria control worker in the South are first, examination of the spleen, and second, identification of anopheles larvae with the microscope.

If we examine the spleens of the small children in

TABLE V. Sant' Anna, Cases of Fever 1922-1923 among those Examined in Survey II, classified by Spleen groups, monthly rates per 100.

Spleen Classes	1922 J	A	S	O	N	D	1923 J	F	M	A	M	J	Annual Rates Per 100
	Months												
0	100.	.....	.....	.....	.....	50.	50.	250.	150.	250.	200.	.....	87.5
1	.....	21.	.....	.....	32.	64	32.	117.	106.	181.	244.	53.	70.7
2	70.	.....	70.	141.	.....	70.	212.	283.	283.	70.	424.	212.	153.
3	300.	300.	.....	.....	300.	600.	300.	300.	300.	300.	300.	.....	250.
4	200.	.....	.....	.....	.....	200.	200.	200.	.....	.....	400.	200.	116.8

a county school, in a few minutes we know accurately more about malaria in that section than microscopic examinations and many physicians can tell us. If we separate the children with enlarged spleens, map out where they live, and drive to their homes in the warm season, we find quadrimaculatus in the houses. Larvae can be found in the ponds about and identified under microscope. Thus in a few hours we can trace an infection to its source and give advice about draining, oiling, screening, quininization or adult destruction.

Few practicing physicians can detect a small spleen. But they consider it a confession of ignorance to admit this. They will not be shown, and hence they never acquire the proper technic.

The general practitioner should learn to make careful examinations of the spleen and include it in his routine examinations. Then he might tell us in what other conditions we may expect enlarged spleens, and what significance to attach to the finding. Thus there is a small enlargement of the spleen very constantly following measles, and this enlargement may persist for more than six months. Often I find enlarged spleens in children with enlarged tonsils, and other chronic pus absorbing foci, malaria being excluded.

If the spleen may remain enlarged for a long time after the infection is gone in a simple disease like measles, I should like to ask Dr. Boyd if a malaria spleen may not persist for some time after all the parasites are removed.

Dr. William Krauss, Memphis, Tenn.—It is agreed that the spleen index gives a record of recent malaria, the parasite index of present malaria. The spleen index is simple, rapid and satisfactory for field work. The figures would vary with the person doing the work, but would be fairly constant for each observer. On the malaria histories in the Memphis General Hospital, even in the Children's Pavilion, the note, "Spleen Not Palpable," is rather frequent. The histories contain the note from the receiving ward, the intern and the house physician, often also that of the attending. Judging from this, some field workers of local health departments might miss many spleens until they have become more expert. A little special demonstration is indicated.

Dr. K. F. Maxcy, Montgomery, Ala.—Appreciating the excellent contribution which Dr. Boyd has made to this subject, I differ with some of the conclusions which he has drawn from his work.

It has been generally accepted that the spleen index, i.e., the per cent of palpable spleens, is the most dependable single index available. As to the value which Dr. Boyd places on measurement of "spleen" volume, I am unconvinced. There are many considerations which render this index of theoretical rather than practical value.

The so-called "average spleen" and the "average enlarged spleen," expressions which were advocated by Sir Ronald Ross in 1908, are weighted averages. As a general proposition, it seems to me that a direct expression of incidence, such as is the spleen index, is more dependable and its significance easier to understand than is an expression weighted by arbitrary values.

Again, observations based upon fluctuations in the size of the spleen can only be utilized where the group examined is sufficiently large and the spleen rate sufficiently high to admit of breaking up into five classes which are large enough to be statistically significant. Especially is the last class, spleens enlarged below the umbilicus, apt to be very small. Before inferences can be safely drawn from the figures derived for the "average spleen" and the "average enlarged spleen," the probable error due to the fluctuations of chance should be considered, and it is difficult to calculate the probable error of a weighted average.

When we speak of measurement of "spleen volume" in this connection, it seems to me that we imply a degree of accuracy which is hardly warranted by the method. It is possible to estimate only one dimension of the spleen, its length, and that very roughly. Dr. Boyd pointed out that the expression "finger's breadth" has a significance varying according to stature. It is also true that there is great variation in the position of the costal margin in narrow-chested and in wide-chested individuals. In some the spleen enlarges more toward the mid-line, in others more in the downward direction. Because of these and other considerations Christophers and his co-workers in India have given up the costal margin as a basis of measurement and have attempted to fix the position of the spleen apex by means of two measurements and a projection upon an abdominal chart.

Most of Dr. Boyd's observations on spleen "volume" were made in the standing position: some with the subject recumbent, according to the exigencies of field conditions. Certainly any method of exact measurement must have as a fundamental that all examinations be made alike in this respect.

I point out these difficulties in the method simply to raise the question whether, after all, the information given by these painstaking and time consuming measurements of spleen size is as dependable, and the significance as easily understood, as is the simple statement of the per cent of persons with a palpable spleen, examined with uniform technic. Certainly as far as the United States is concerned there are very few localities where statistically significant groupings of this sort are available. In this country the greatest value of spleen examination attaches to a simple statement of the percentage of positives found, and the use of these positives in locating malaria foci.

The conclusion that splenomegaly is more closely a measure of the incidence of infection with *Plasmodium vivax* than of *Plasmodium falciparum* does not seem to me to be demonstrated by the data presented. The ratio of the finding of *Plasmodium vivax* to the finding of *Plasmodium falciparum* is approximately the same, four to one, in the group without, as it is in the group with, splenic enlargement, except in those with very large spleens, where the group is too small to be significant. It must also be borne in mind that the finding of one species of parasites on a single examination of the peripheral blood does not exclude the presence of the other in small numbers, or latent.

MALARIA ACTIVITIES*

By JOHN A. FERRELL, M.D.,
International Health Board,
New York, N. Y.

The International Health Board has continued its malaria field studies and its training station for personnel at Leesburg, Georgia. Dr. Boyd is now Director, having succeeded Dr. S. T. Darling, deceased. Developments tending to broaden our knowledge of malaria will be reported by Drs. Boyd and Collins.

The training station has provided training for 42 of the International Health Board staff members and fellows. The majority of them are now serving in foreign countries. Twenty-three health officers, scheduled for state or county malaria control work have taken training at the station. As malaria control measures cannot be made effective without competent, trained personnel, interest should be focused on improving and enlarging facilities for training. Dr. Boyd is now giving consideration to broadening the scope of the work of his station, so that the problems presented in different sections may be studied, and the efficacy of the methods of control employed, may be checked. He has in mind continuing observations in southern Georgia, where the lime sink is the chief source of the breeding of the malaria mosquito. He will extend his observations to the anopheles' breeding areas of the tidewater countries, and also to the hydro-electric reservoirs in the hills. The students, in addition to studying the factors which produce malaria, will be afforded opportunity, as far as practicable, to become acquainted with effective control measures for each type of malaria problem. No feature of the malaria program outranks in importance that of training personnel for the directive positions.

In order to make it possible for the state directors and county health officers, including those already at work, and new ones about to begin work, to take special training in malariology, the Board, as in other branches of public health work, has aided the state to supply traveling expenses and, where necessary, stipend, to appointees, through brief periods of training. The health officers usually spend from two to four months at the training station. When states have no funds that can be used for this purpose, the Board, in meritorious cases, has supplied the entire amount. It is hoped the wisdom of having all new health officers for malaria work obtain at least a few months of preliminary training will be so conclusively demonstrated that the states will obtain from the leg-

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NUMBER OF TOWNS AND COUNTIES IN WHICH THE INTERNATIONAL HEALTH BOARD HAS AIDED TOWARD CO-OPERATIVE DEMONSTRATIONS IN MALARIA CONTROL

	1920			1921			1922			1923			1924			1925			Total		
	Town	County	Central Admin.	Town	County	Central Admin.	Town	County	Central Admin.	Town	County	Central Admin.	Town	County	Central Admin.	Town	County	Central Admin.	Town	County	Central Admin.
Alabama	7			4		*	3	1	(*)	4		(*)			(*)		3	(*)	18	4	1921-25
Arkansas	7			1		*			(*)			(*)			(*)			(*)	8		1921-25
Georgia	4								*			(*)			(*)			(*)	4		1922-25
Louisiana	3		*	1						3	1	(*)		1(1)	(*)		(2)	(*)	7	2	'20,23-25
Mississippi	6			7		*	5(1)	1	(*)	2	1(1)	(*)		(2)	(*)		4	(*)	20	6	1921-25
Missouri						*		6			1(2)			(2)			(2)			7	1921
N. Carolina	4			1					*		4	*		3(4)	(*)		(3)	(*)	5	7	1923-25
S. Carolina	4		*	9(3)		(*)	4(3)		(*)	3(1)	1	(*)		2	(*)		(2)	(*)	20	3	1920-25
Tennessee	2			2			2				3			(2)			(2)		6	3	
Texas	10			5					*		2	(*)		(2)	(*)			(*)	15	2	1922-25
Virginia	5					*	4(1)		(*)		4	(*)		2(3)	(*)		1(4)	(*)	9	7	1921-25
Illinois							1			2			1			1(1)			5		
Total new operations	52		2	30		5	19	8	2	14	17	1	1	8		1	8		117	41	9
Accumulative to date				3		1	5		5	1	3	8		16	9	1	16	9			
GRAND TOTAL FOR YEAR	52		2	33		6	24	8	7	15	20	9	1	24	9	2	24	9			

* Central Administration.
(1) Figures in parenthesis represent activities which were continued.
NOTE: No budget for survey in California.

islatures, funds that can be used for training the personnel.

The Board's participation in malaria control activities in the United States during 1925 has continued along established lines. Financial aid is given to the state boards of health for state and county projects. The expenditures have been chiefly to provide epidemiologists and sanitary engineers who will devote themselves specifically to malaria work. They endeavor to define the malaria problem in the various counties, to develop county health organizations to feature malaria control, and to train the county personnel. They supervise the work in the state and serve the county and town authorities in a consultant capacity. The Board has aided also by making contributions to county budgets. The aid given by the Board is considered as relatively temporary. The state and county are committed from the beginning to the assumption of the entire expense as rapidly as practicable.

The county organization for combating malaria is essentially the same in character as that engaged in general public health work. The size of the county in area, population and wealth, determines, usually, the size of the county budget and the amount of personnel. The smallest unit that has been tried consists of a health officer and a public health nurse at a yearly cost slightly in excess of $6,000. A few small Virginia counties are operating on this basis. The representative from that state can speak of the work and the efficacy of such a unit. It is smaller than is desirable. It would be advantageous to make the minimum unit contain also a sanitary inspector and an office assistant, and these items cannot be added without an additional fund of $3,000 or $4,000. This means the minimum budget would be $9,000 or $10,000 a year. Where practicable, it is desirable to increase the number of nurses and sanitary inspectors. This can be done without increasing overhead expenses. Consequently, the larger unit makes for economic efficiency. Some units are able to have a laboratory technician. If a competent one is obtainable the value of the county work will be greatly increased. Each member of the county staff has definite duties to perform. The health officer supervises the work and does the work which cannot be done so well by the nurse, sanitary inspector or office assistant, and delegates to the other staff members such duties as they can perform satisfactorily and more cheaply than he can perform them himself. Drs. Maxcy and Smillie submitted in New Orleans, last fall, a program for county-wide malaria control by the county health organization. The Public Health Service will, I presume, publish this plan. Doubtless many of you are already familiar with it. It is needless for me to say that growing experience and a larger number of trained workers, will lead to increased efficiency in county-wide control measures.

The record of the Board's participation during 1925 to date, in the control measures mentioned, is shown in the accompanying table.

It will be noted that aid has been given to nine state boards of health to central administration, and to nine states toward 41 county organizations. The cumulative figures since the Board's cooperation began, about five years ago, are:

No. states aided	9
No. towns aided	117
No. counties aided	41

The Board's contribution in no instance has exceeded 50 per cent of the cost of the central supervising staff, or 25 per cent of the cost of the county organization.

Plans for 1926 contemplate a continuation of the program outlined above.

61 Broadway

MALARIA CONTROL ACTIVITIES IN ALABAMA*

By S. W. WELCH, M.D.,
State Health Officer,
Montgomery, Ala.

The plan in 1924 of doing malaria control work through the health units of the several counties was partially followed in 1925. Instead of working intensively the engineers only went on call. Work was undertaken in all of the twenty-eight organized counties except five. The foci were classified as follows:

Known endemic foci	118
Number of these surveyed	87
Number of foci eliminated	10
Number of foci partially controlled	45
Number of old foci under maintenance	34
Population protected	336,771
Cost of control (labor and material)	$43,851.30

The cost of control does not include the money spent by the Federal Government on Wilson Lake or any of the impounded projects.

An understanding of the scope of the above items can best be obtained through a consideration of the interpretation placed upon them by the Alabama State Board of Health. Considerable attention has been given report forms during the present year. In the case of malaria control there has been an evolution in the method of reporting. Formerly activities alone were reported. This organization now is giving attention to results. The above summary is offered as evidence.

Attached are the report form now in use and a copy of the interpretation of the items. These have been devised by the Bureau of Administration in collaboration with the Bureaus of Epidemiology and Sanitary Engineering, following up a plan suggested at a conference a year ago with the health authorities of North Carolina, Ohio, the United States Public Health Service and the International Health Board.

IMPOUNDED WATERS

In 1924 there was a very severe outbreak of malaria in the territory contiguous to Gantt, due to the fact that no control measures were applied. Legal measures were instituted to compel the company to apply control measures. Prosecution was withdrawn when the company voluntarily agreed to enforce the regulations of the State Board of Health governing impounded waters. The impounded waters were released

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(Report only at end of year's control activities, not later than December 1)

	Beginning of Season	Increase During Season	Decrease During Season	Total at End of Season
Known endemic foci in county			XXXX	
No. of these surveyed				
	During Season			
No. of foci eliminated				
No. of foci partially controlled				
No. of old foci under maintenance				
Population protected				
Cost of control (labor and material)				

and the basin cleared and quinin used freely by the county health unit. The control measures adopted resulted in a reduction of about two-thirds of the number of cases of malaria for 1924. Standard quinin treatments will be carried on through the winter and we hope to have a larger number of carriers eliminated before the opening of the season in 1926. The company will begin active control measures with the opening of the 1926 season.

Two other large impounded projects were in process of construction during the year, Cherokee Bluff by the Alabama Power Company, which will be one of the largest impounded water areas in the country, and the other is at Bartlett's Ferry on the Chattahoochee River between River View, Alabama, and Columbus, Georgia. Both of these companies have cooperated very cordially in complying with the regulations of the State Board of Health governing impounded waters.

A large number of small projects have been constructed. The promoters of these smaller projects have conformed to the instructions of the State Board of Health in mosquito control work.

It is too early to give a positive statement of the number of deaths from malaria. The cases reported up to December 1 indicate that control measures have resulted in a further decline of the death rate from this disease in Alabama. Attached hereto is a chart showing the death rate from malaria in Alabama since 1917.

Considerable work has been done in the improvement of methods of control. Mr. J. C. Carter of the United States Public Health Service worked out an improvement of the apparatus used by Dr. T. H. D. Griffitts for spraying oil upon areas of impounded water. A cut of this apparatus has been furnished the United States Public Health Service, and will appear in the report of the State Board of Health for 1925.

Another method of control worked out by the Alabama Power Company and more completely and extensively applied by Stone and Webster at Bartlett's Ferry, was the tieing down of felled trees so as to prevent floatage when the water was impounded. This promises not only to be a great aid in the control of malaria, but a very profitable investment from an economic standpoint to the company.

The control work by the Federal Government on Wilson Lake was not as effective as it might have been. The top minnow supply was very numerous and probably aided very greatly in reducing the mosquito output. The methods for oiling were not as successful as they might have been had different equipment, different methods and more adequate machinery for spraying been used. It is hoped to get these minor difficulties removed before the beginning of another season.

Another step in the control of impounded waters on navigable streams has been taken, with special reference to Lock 18 on the Coosa River. Here the Federal Power Commission made their permit conform to the major requirements concerning construction and preliminary preparation as prescribed by the State Regulations.

Foreword.—By malaria control is meant the establishment of measures which result in a partial or complete suppression of malaria.

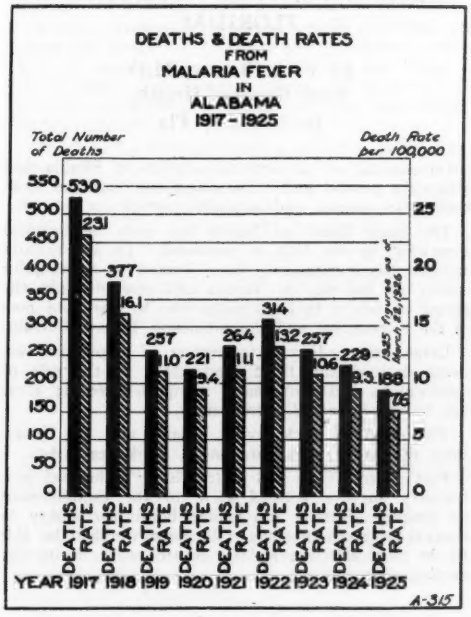
Known Endemic Foci in County.—The term endemic focus is used to describe an area in which malaria is being transmitted. For the purpose of uniformity in reports all anopheles producing areas in an urban community where malaria is being transmitted would generally be classed as one focus. Foci listed in rural sections would only be given separately when such areas were not within two miles of one another.

Note: The column heading beginning of season provides for the recording of all foci in existence at the beginning of the season's control activities. If additional foci developed during the season they should be recorded under increase during season. If foci are eliminated (see definition below) the number eliminated will fall under decrease during season. Total at end of season will then be the number at beginning of season plus increase during season minus decrease during season. Further, the total at end of season should equal the sum of the number of foci partially controlled plus the number of old foci under maintenance, (see definitions below) plus those foci over which no control was exercised during the season, the latter not appearing as an individual item in the report, but which figure the central office may obtain by deducting the number of foci partially controlled plus the number of old foci under maintenance from the total at end of season.

Number of These Surveyed.—It may be said that a focus has been completely surveyed when the existence of an anopheles producing area has been demonstrated and the existence in this area of cases or carriers has been established (by blood, spleen examination or both. A history index, unsupported by blood or spleen examination, is not considered sufficient).

Note: The column heading total at end of season as applied to the number of foci surveyed, is the sum of the number at the beginning of season plus increase during season (if additional foci have developed and have been surveyed).

Number of Foci Eliminated.—A focus is eliminated only when new cases (not relapses) cease to appear



in that area and temporary measures such as the use of larvacides or fish can be abandoned.

Number of Foci Partially Controlled.—A focus may be said to be partially controlled when there is a decrease in the number of cases (not relapses) when compared with the number that occurred during the preceding season, provided: that the decrease is a direct or indirect result of control measures instituted by the health officer.

Note: This item refers only to those foci over which control has not been previously exercised. Control of old foci is dealt with in the next item.

Number of Old Foci Under Maintenance.—In a number of places in the state continuous control of old projects is necessary. Dothan, Mobile and Selma are examples. This item has, therefore, been entered to cover maintenance of areas that formerly were foci and that would probably become foci again if continuous control were not maintained.

Population Protected.—This figure will represent the number of individuals protected as a result of the complete elimination of foci, the partial control of foci, and the maintenance control of old foci, provided the individuals live within flight range (1½ miles) of the areas in question.

Cost of Control (Labor and Material).—Self-explanatory.

MALARIA CONTROL ACTIVITIES IN ARKANSAS*

By C. W. GARRISON, M.D.,
State Health Officer,
Little Rock, Ark.

Malaria control activities in Arkansas for the year, 1925, have comprised mainly the continuance of control measures in the old urban units, with the addition of several new municipalities undertaking the work for the first time. Surveys have been made in a number of cities contemplating control measures, and reports submitted with recommendations as to procedure. Two of the cities doing work in previous years relaxed greatly in their efforts during the past season, making the effectiveness of their efforts almost negligible in so far as materially reducing the mosquito population.

In addition to the urban units, regular visits were made to the four District Agricutural Colleges where control measures were being conducted. The chief purpose of our efforts at these colleges is accurately to inform the students regarding the cause of malaria, and practical methods of preventing mosquito breeding.

The Crossett Lumber Camp has continued its activities and has maintained almost perfect control under the most difficult circumstances. The State Boys' Industrial School has done effective work which has a great educational value.

The St. Louis Southwestern, Rock Island and Missouri Pacific railroads have continued their programs, the latter making many extensions in the number of persons protected. The outstanding feature in connection with the railroad work was the educational campaign put on by the Missouri Pacific railroad through the Better Health Special Train, which went over the Company's lines in Arkansas, visiting ninety cities between July 20 and August 13. This train consisted of an exhibit car, lecture car, baggage and equipment car, diner and pullman for the train personnel. The purpose of the train was to awaken a more active interest in public health problems, with particular emphasis upon malaria. It was a notable success, and of inestimable value from an educational standpoint. The total number of persons passing through the exhibit car was 38,000, a large number being from the rural districts. The Missouri Pacific railroad is doing a great work in Arkansas, not only in protecting its employes against malaria infection, but in educating thousands of citizens of the state as to the cause and prevention of this disease.

The newspaper publicity given to malaria control work throughout the state deserves special mention. It would seem that the interest manifested indicates clearly upon the part of the newspapers, a desire to bring the whole state to recognize definitely that malaria is largely a preventable disease and should be at-

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tacked with vigor by every official and voluntary agency within the state.

The Rock Island lines in Arkansas have been conducting excellent publicity work, and following a survey which is now being made by the Sanitary Engineer of the St. Louis Southwestern railroad, it is expected that active control measures will be instituted.

No county-wide malaria control work has been undertaken, but considerable rural work has been done in a number of counties, particularly Pulaski, which has a full-time county health officer, who is giving attention to the malaria problem.

Briefly summarizing, the season's activities have resulted in continued protection to citizens in urban units, some of which have been doing the work for seven to eight years. A more wide-spread interest in the prevention of malaria is most notable, largely through the excellent work of the Missouri Pacific railroad and the St. Louis Southwestern railroad. It is my experience that the citizens of Arkansas are rapidly learning the story of malaria infection and prevention, and we have reason to hope for a marked reduction in the incidence of this disease during the next few years, particularly in the cities.

The rural malaria problem is most difficult in Arkansas, but with the assistance of the county nurses, rural school teachers and Home and Farm Demonstration Agents, all of whom are assisting in educating the rural residents, it is felt that some progress is being made.

The urban population protected during the 1925 season was approximately 250,000, living in thirty cities.

No new methods of anopheles or mosquito control, have been employed, although observations on the effectiveness and economy of certain larvicides have been continued. It is our opinion that there is no larvicide with which we have had experience, that is more economical than oil for treating natural breeding places. The use of larvicides in fire barrels and artificial containers is effective and sometimes more desirable than oil.

Several of our cities in the rice belt are desirous of undertaking the control of mosquito breeding in the adjacent rice-growing territory by spreading arsenic dust by means of aeroplanes. It is hoped that the effectiveness of this method of control can be determined next season.

A long experience confirms the conviction that the state should continue to exercise more or less general supervision over malaria control work in the urban districts. Limited experience and extensive conversation with rural workers in other states, forces the conclusion that rural malaria control as affects a state or the South, can accomplish little until large appropriations from the Federal, state and local governments and voluntary agencies, are available, and a far more intensive and comprehensive campaign is launched than is being done, or can be done by a county health department, even though the department be adequately provided with funds and personnel for executing a well rounded health program exclusive of malaria control.

MALARIA CONTROL ACTIVITIES IN FLORIDA*

By F. A. BRINK, M.D.,
State Board of Health,
Jacksonville, Fla.

On account of the unusual activity in Florida real estate the general public has taken less than the usual interest in malaria and mosquito control.

The State Board of Health has been handicapped somewhat by the lack of personnel. Its anti-malaria activity has consequently been limited to a mosquito survey of the city of Tampa and environs and the giving of advice to local authorities by the field men of the Engineering and Communicable Disease Bureaus.

Large areas adjacent to centers of population are being drained and filled preparatory to the sale of subdivisions and thus many mosquito breeding areas are being eliminated permanently.

The cities of Jacksonville, Miami and St. Petersburg do active mosquito control work regularly.

Fort Pierce, Vero and Indrio have authorized preliminary surveys with a view to the establishment of drainage districts and issuing bonds for money to control mosquito breeding. We hope we shall be able to do more effective malaria control work during the coming year.

MALARIA CONTROL ACTIVITIES IN LOUISIANA*

By OSCAR DOWLING, M.D.,
State Health Officer,
New Orleans, La.

The State Board of Health has given engineering supervision to malarial-mosquito control campaigns in twenty different communities. Surveys and cost estimates are made for those who are interested and are considering undertaking the work. Surveys to determine extent and distribution of malaria incidence have been made in four parishes and plans for control work in these parishes have been furnished the director of the Parish Health Unit.

In two of the units the State Board of Health is giving engineering assistance in making surveys and cost estimates, running levels and promoting the work. Particularly good results have been secured in Natchitoches Parish due to the very excellent cooperation received from the public officials and the public in general, an organization known as the Citizens' Anti-Malaria being of considerable assistance in furthering the progress of the work.

We propose next year to continue along the same lines. We will endeavor to extend our surveys of incidence in one or more new parishes and to continue in

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promotion of malaria control on a parish-wide basis through the full-time parish health unit.

A very extensive development scheme to include provision for navigation, irrigation and power development is being promoted by private interests and brings up the problem of impounded waters and their probable influence on malaria. Regulations have been adopted on this subject.

The board is interested and is giving its support to a plan being promoted by officials and business interests of Alabama, Mississippi and Louisiana to investigate the the salt marsh mosquitoes with a view toward abatement of the Gulf Coast mosquito nuisance.

MALARIA CONTROL ACTIVITIES IN MISSISSIPPI*

By F. J. UNDERWOOD, M.D.,
State Health Officer,
Jackson, Miss.

Beginning in 1922, the malaria control program of the Mississippi State Board of Health was made to apply primarily to county-wide projects.

A division of malaria control is maintained as part of the central organization to render aid and advice, and encourage the development of malaria control throughout the State with special reference to full-time county health departments.

There are 13 active full-time cooperative county health departments at present in the State of Mississippi. Five of these counties are in the true malaria belt and have problems in malaria which are considered to be of sanitary importance, while the remaining counties have more or less malaria to deal with, yet their rates are hardly comparable with those counties in what is termed Mississippi's malaria belt.

The plan of the Mississippi State Board of Health in instituting malaria control work is essentially to make a study of the problem within any given county, determine the foci of infection and the contributing factors thereto, and decide what suitable inexpensive methods can be employed to control the disease.

In the spring of this year such a survey was started in Coahoma County, which maintains a full-time health department, and conclusive information has been obtained which indicates the true status of malaria prevalence in the county, and a practical program for next year is being mapped out to be instituted by the county health department.

In one other county in Mississippi, which unfortunately does not maintain a full-time county health department, there being a part-time health officer having under his direction the accepted standard full-time personnel, malaria control work has been continuous for the last four years with marked results. A program was instituted in this county in 1922 and its value proven before adoption by other counties in the State.

For the year 1926, it is planned to carry on malaria control work as part of the regular program in each full-time county health department in the State, where malaria presents a problem of sanitary importance. With the beginning of 1926, there will be 21 active full-time cooperative county health departments in the State.

A study of the situation in Mississippi reveals the fact that no definite program to control malaria can be decided upon in any given area until it is first determined what the problem is so far as the distribution of malaria goes, and those factors contributing to it, and the methods of control which might be put into practical use.

For this reason, it is essential that full-time county health departments should be rendered advisory aid from the central office, which makes a division of malaria control with an adequate personnel imperative to the success of the undertaking.

With this in mind, steps have been taken to expand the personnel of this division, and render assistance to additional counties in adding malaria control to their present program.

The successful control of malaria, as well as any other health menace requiring field sanitation, rests with adequate and well-trained field personnel. In this respect, well-trained sanitary inspectors attached to full-time county health departments are required. After a malaria control program has been instituted in a county, it is expected that the personnel connected therewith and the operations of the program shall be absorbed into the general program of the county health department and made a permanent part thereof.

That malaria can be controlled on a county-wide basis has been most strikingly demonstrated in Mississippi, where in one of our counties, after four years of continuous work, there has been a reduction in malarial fever of approximately 80 per cent, bringing the rate from one of the highest for any county in the malaria belt to one comparable with those in counties where malaria is not considered of great sanitary importance. The cost has been surprisingly low, and the program practical in all respects is being used as a model for other counties in the State.

In general, the status of disease reporting in Mississippi is highly satisfactory. Of the nearly 1,500 physicians practicing in the State, reports are received monthly from approximately 96 per cent of this number.

Different values may be placed upon these reports, and, so far as malaria is concerned, the reports give an excellent comparison and serve as a guide in segregating and studying the problem.

Mississippi is in the registration area for deaths, and accurate information is available at the close of each year regarding deaths from malaria.

Special efforts are made to encourage laboratory diagnosis of malarial fever, and during the last two years the number of examinations made will have increased from approximately 10,000 to 12,000 blood examinations per year.

Educational work in regard to malaria control is constantly carried on, and a very marked interest has been shown recently by commercial bodies within the State.

The Mississippi State Board of Development has been most considerate in thoroughly going into the malaria problem and studying its economic relations to the development of the State, and has lent its support in a number of ways to furthering the program of the State

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Board of Health. Chambers of commerce have been active in soliciting information relative to malaria versus industrial development, and it is particularly evident at this time that with sufficient appropriation the Mississippi State Board of Health will be able to make greater strides in the future toward eliminating malaria than have yet been thought of in the past.

During the last 10 years malaria morbidity has been reduced 50 per cent and mortality 86 per cent, the greatest part of this reduction having occurred since 1921.

MALARIA CONTROL ACTIVITIES IN MISSOURI*

By JAMES STEWART, M.D.,
State Health Commissioner,
Jefferson City, Mo.

Malaria was once prevalent through Missouri, but with the contraction of the malaria zone, Missouri, like many other States of a similar latitude, has been freed of the infection, with the exception of a few epidemic foci, namely, in the order of their importance: (1) the so-called Southeast Missouri section; (2) the Missouri River bottoms; (3) to a certain extent the areas contiguous. Scattered through the State occasionally there will be reported a case of malaria or a death from this disease. In some instances these will be true malaria, but more often their basis will be residual recollections rather than residual or new infection. A problem now pending, but not yet present, is the control of malaria in impounded waters.

Southeast Missouri is essentially a part of the Mississippi Delta region, familiar to all of you, which has been reclaimed through an elaborate system of drainage. Deforestation has gone on simultaneously with ditching since about 1900 and now the section is practically clear of timber and standing water. At first, general farming was followed, but recently, because of the ravages of the boll weevil in the South and the rising price of cotton, general farming has been entirely supplanted by cotton farming, and changed the entire composition and character of the population. Southern negroes are daily migrating into this section and taking the place of the tenant whites who formerly tilled the soil.

Indirect malaria control measures, that is ditching, have been going on since 1900, but have been considered as an agricultural rather than a health measure. Direct control measures were started about four years ago along the following lines: Education, screening, individual farm drainage, and to a limited extent ditch maintenance. Wholesale quininization was thought of, but abandoned. The towns and the better rural homes have been practically freed of malaria, but among the tenant population all that was accomplished toward improving their homes has been practically nullified through the change in the character of the population. Malaria was recently made a reportable disease, but up to date reporting has been very incomplete. The deaths from malaria remain more or less stationery, with some fluctuation from year to year. Recently we have been sending questionnaires to each physician reporting a malaria death. About 50 per cent have replied, giving information that clearly shows that the cause of death was not substantiated by laboratory examination. Our State Board of Health laboratory was established a little over a year ago. It has not been used extensively as yet for the diagnosis of malaria, but of the slides submitted up to date less than 10 per cent were positive, all of which indicates that our present information is by no means authentic. The fragmentary knowledge which we have, however, together with surveys that we have made, leads us to believe that the malaria problem in Southeast Missouri is rapidly disappearing, and its final eradication will ultimately resolve itself into a problem of ditch maintenance. Except in the early spring, the ditches are the only bodies of water remaining for any period of time. The soil has now been practically dehydrated, and the general ground water level has sunk from what it was a few years ago, about 10 or 12 feet, to about 16 or 18 feet. We are now concentrating our efforts on ditch maintenance, believing it to be a positive and single method of permanently eradicating malaria. Most of the drainage districts have established a maintenance fund. The amount of clearance varies. One county with 550 miles of ditches reports 131 miles cleared during 10 months of 1925. This is the greatest amount of clearance reported from any one county for a similar period. We are making an epidemiological investigation to determine primary foci of infection with a view to concentrating our efforts on these areas.

Malaria in the Missouri River bottoms is not a problem of any magnitude. The chief outbreaks reported have been in boat crews and other itinerant workers.

Malaria in the hill areas is sporadic. In former years when the tenant population of Southeast Missouri was drawn from the adjoining hill sections, these localized outbreaks of malaria were more frequent, but in almost every instance, so far as our knowledge goes, and for reasons with which we are not familiar, the disease wore itself out in a season.

Just what our problem with the impounded water will be, I am unable to anticipate. For several years there has been a dam on the White River backing the water up for several miles through a rather narrow ravine, with wooded edges. This has been developed into quite a resort region. Nothing extensive has ever been done to combat malaria in this area, and neither has it ever developed. At the present time a larger project is contemplated on the Osage River, a short distance from Jefferson City. In recent years very little malaria has occurred in the basin of this water power project. During a recent mosquito survey, however, a fairly high proportion of quadrimaculatus mosquitoes were found. This area is close to the Missouri River bottoms, where localized outbreaks of malaria occur. Just why the basin of the contemplated power project should be free has not been ascertained. Working in cooperation with the United States Public Health Service, we have made a preliminary study of the possibility of malaria in this area, and have made recommendations to the power company, which they are now taking steps to carry out.

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MALARIA CONTROL ACTIVITIES IN NORTH CAROLINA*

By H. A. TAYLOR, M.D.,
Deputy State Health Officer,
Raleigh, N. C.

The department created and assuming the administrative duties for the control and investigation of malarial fevers in North Carolina is financed jointly by the State Board of Health and the International Health Board. The department thus created seeks to organize local county health departments whose duty it is to carry on investigations and control measures wherever the disease is prevalent enough to justify the effort and expenditure of money. While the primary object of the department created is necessarily the mapping out of the malarial problem in all the counties within the malaria zone and instructing employes of local county health units in measures for the control of the disease, there is a secondary object of even greater importance—that is, the stimulation of permanent interest and activity in public health work in general and the local administration of methods whereby disease prevention can be carried on economically and on a large scale by free and generous support of full-time local health departments.

The department created has been instrumental in organizing seven full-time health departments located in the malaria zone of the State, whose duties are confined principally to the control of this disease. The departments operate on an annual budget of $10,000 per year, with a personnel consisting of a full-time medical director (county health officer), two field assistants, one microscopist and one clerical assistant. Each department, with a health officer acting as executive head, assumes full responsibility for intensive control measures in the respective counties, and while there are certain mandatory activities to be taken care of by each department special effort is made to have at least 75 per cent of the time of each employe devoted to the control of malarial fevers.

The management of all seven of the departments, known as counties doing malarial work, the supervision of all financial transactions and the purchase of all supplies, are functions of the office of central administration. At the central office there is a clerical assistant who has immediate charge of the bookkeeping, and who concerns herself directly with the clerical features of this particular phase of the county health work.

On completion of the organization of the departments, the health officers seek to outline or determine the areas of concentration of the disease in their respective counties, and, in view of the fact that malaria is essentially a rural disease, control measures are confined principally to the rural section and small villages of the county. The first step of the departments has been to gather data as to the apparent prevalence of the disease in the county by the examination of school children between the ages of 2 and 12 for enlarged spleens, the taking of history indices as to positive or negative malaria, the establishing of blood indices and the securing of mortality statistics from the State Board of Health. From the data elicited during this preliminary survey, the health officer obtains a fairly accurate idea as to the prevalence and distribution of the disease in his respective county. From such records it is naturally shown that certain foci of infection exist in the county and are the only areas requiring immediate control measures. Having established the area or areas where the disease is most prevalent, the department prepares a survey, or spot map, showing each home thereon in relation to permanent collections of water, with special reference to those streams breeding malaria mosquitoes. In areas where anti-mosquito measures are considered feasible, all the collections of water are indicated on the survey map and character indicated as to whether permanent or temporary. The density of mosquitoes in relation to occupied houses is a feature, also, of the department. From the data elicited during this survey the health officer is in position to determine the most feasible and economical measures of control which in the tidewater section consists of a combination of all measures at our command.

It is a purpose of the board to continue and extend measures for the control of malaria as rapidly as the organization and funds will permit. The problem which will confront us during 1926 is the impounding of water for hydro-electric purposes. The plan now in effect for handling such problems is to extend the malaria and mosquito survey over the areas of any proposed project for at least twelve months prior to the impounding of water for the purpose of determining what if any influence the impounding of water may have upon the mosquito rate or malaria incidents. The same measures employed prior to the impounding of water will be extended over a period of not less than twelve months after water has been impounded. By such methods it is hoped to obtain comparative data which may be used as a basis in formulating rules and regulations for the control of similar projects.

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MALARIA CONTROL ACTIVITIES IN SOUTH CAROLINA*

By JAMES A. HAYNE, M.D.,
State Health Officer,
Columbia, S. C.

The malaria control work in South Carolina during the current year has consisted of routine measures heretofore employed: principally drainage, the use of quinin and screening. The operations have been carried on in counties where county health officers are stationed. The first requisite in doing malaria control work, is to find out where malaria exists. Last year much work was done along these lines by means of the school census card. This year the school census card was not employed extensively because the time of the personnel was taken up with collecting weekly reports from physicians on communicable diseases, the plan of sending out cards each week having been adopted in March of this year.

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Some of our county health officers are making spleen examinations a part of the routine medical examination of school children. The most difficult phase of malaria control work appears to us to be to arouse the sincere interest of the county health officer in malaria control work. The tendency is for him to minimize the malaria problem and to devote his time to other health problems which are more easily solved, and render more spectacular results; results which will have a news value which he can use in advertising his health department to the politicians who control the purse strings. It is unfortunate that this condition exists, but it is a reality that must be considered.

The next most difficult work we have is to interest the county inspector in malaria control work, having failed to interest the county health officer. In those counties where the inspector is a part of the health unit this has been accomplished by sending him to the International Health Board field station for a few weeks' training. This has proved very valuable, but because of the lack of funds to pay the inspector's expenses, it cannot be extensively employed.

We have endeavored to exercise supervision over impounded water projects so as to minimize the increase of malaria in the vicinity of such projects. Regulations adopted by our board last year are similar to those adopted by other states and call for the clearing of the reservoir site before it is flooded. At a project now nearing completion in this state, these operations will have cost the company nearly a half million dollars. This is nearly 10 per cent of the total cost of the hydro-electric project. Our malaria investigators ought to find a cheaper method for controlling malaria because this method adds considerably to the total cost of developing electrical energy and tends to retard development of our natural resources, as well as tends to increase the rates at which electrical energy can be sold to the public.

We have completed malaria control projects at some new towns in the state this year and have exercised supervision over the maintenance work at towns where work was undertaken in previous years.

An interesting side light of the mosquito situation this year occurred in the plague of pestiferous mosquitos that invaded a number of towns, principally in the Piedmont section of the state. Most of these mosquitoes were *Culex quienquefasciatus*, a variety of Culex that breeds very profusely in sewage contaminated waters. In two cities in the state the city health officer was almost obliged to leave town because of the flood of complaints that reached his office.

The figures we have collected on malaria prevalence since March through our weekly system of reporting by physicians indicates that physicians in our state saw at least 11,000 cases of malaria between March 1 and October 31. During the same period physicians reported 66 deaths from malaria, making one death to 167 cases. We do not know what percentage of malaria cases are seen by physicians. In malarious sections the percentage is smaller than it is in sections which are not so malarious.

We feel that our biggest problem is to interest the county health officer and the county inspector in malaria control work. Malaria deaths have been decreasing consistently from 312 in 1926 to 119 last year. The number for 1925 promises to be lower than last year, only 66 having been reported up to October 1.

MALARIA CONTROL ACTIVITIES IN TENNESSEE*

By E. L. BISHOP, M. D.,
State Health Officer,
Nashville, Tenn.

Malaria control operations have been made a major element in the program of two full-time county health departments. In Gibson county, considerable information as to local foci has been secured by questionnaire, surveys of school children, and by the spleen index. Control operations consist of supervision of agricultural drainage, five thousand yards of ditching having been blown during the year; supervision of highway construction; the use of fish; and the use of the standard quinin treatment.

In the other county, Obion, the principal activity has been devoted to mosquito control operations in the municipalities, and to study of the problem about Reelfoot Lake.

The report of activity by the Division of Sanitary Engineering may be summarized as follows:

During the year, the Division made complete preliminary surveys, with estimates of cost, and gave complete detailed instructions in verbal and written form for malaria control and mosquito eradication for the cities of Lebanon, Ripley, Chattanooga, Gallatin and Cookeville. The above surveys were made for "new" work. The latter three cities undertook the mosquito eradication and the Division was very much pleased with the results obtained. A description of the activities by Cookeville will be given in another paragraph.

The Division of Sanitary Engineering also made surveys for the successful continuance of this work at Columbia, Covington, Cowan, Dyersburg, Murfreesboro, Union City and Brownsville. All of these cities during the past year did malaria control work, the cities of Jackson and Memphis also did malaria control work, Memphis having its own sanitary engineer employed.

Tennessee experienced its first malaria epidemic due to impounded waters this year. This was near Cookeville, where the city had installed a municipal hydro-electric plant, damming up water in the Falling Water River for some three miles. Case histories, symptoms and blood smears authentically confirmed the malaria. A complete sanitary survey was made by the Division of Sanitary Engineering in cooperation with the U. S. P. H. S., and the city immediately started control work. The lake was cleared of floating logs and other floating debris, the shore lines were partially cleaned of brush and grass, and the shore lines not thus cleaned were sprayed with oil. The spraying was done from boats and knapsack sprayers were used.

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The Division cooperated with the counties of Shelby, Gibson and Obion on county-wide malaria and mosquito eradication work. Shelby county has a competent inspector in charge of the work, who is employed all the year around, and the problem is attacked on a very comprehensive scale. The other two counties are doing good work.

MALARIA CONTROL ACTIVITIES IN VIRGINIA*

By E. G. WILLIAMS, M.D.,
State Health Commissioner,
Richmond, Va.

Fifty-five per cent of the physicians of Virginia reported communicable diseases in 1922; in 1924, seventy-nine per cent reported. Although a greater percentage of physicians were reporting in 1924 than were reporting in 1922, the number of cases of malaria reported by physicians has gradually decreased.

In conjunction with the above, the malaria bureau commenced taking a school history index in nine counties for malaria, with the hope that some correlation might be found between the two methods of measuring malaria. Last year the following was stated: "The reporting of malaria by local physicians and the discovery of foci by county health officers has checked so favorably with the school history index, as to cause the malaria department to make this an annual activity." The school history index taken for 1924 seems to shatter the hopes that some correlation might be found between the methods of measuring malaria, namely, by physicians' reports and by the school history index. I regret to report that no adequate yard stick has so far been found for measuring malaria in Virginia.

Education.—The educational program is being carried on by the county health officers by lectures, fair exhibits, distribution of literature, newspaper publicity and moving pictures. The malaria catechism is being used in the schools.

MALARIA ACTIVITIES THROUGH THE COUNTY HEALTH DEPARTMENTS

Field Studies.—As the field studies and investigations have not been completed by the county health officers for this season, it is impoossible to give complete data at this time. The Russell method of identification of Anopheles larvae is being used in all investigations and surveys. It has served to create a greater interest in malaria work by county health officers. It is rapid, interesting, and saves much of the health officer's time.

Our continued observations and studies show the *Anopheles quadrimaculatus* to be the main malaria vector in Virginia.

Pond Control.—During the year the study of pond control has been continued and added to, materially. Fluctuation of ponds continues to bring substantially the same measure of control as the first season's work indicated. However, it was found that in the larger ponds, in the upper reaches of which the water shoaled very gradually, that one lowering of the water level was insufficient. Once or twice, later in the season, it was necessary again to lower the pond level. This measure was found entirely successful, removing new floatage accumulations, and killing new water plants such as algae that started in the new shallows.

Pond control has so far been secured largely through persuasion, but a bill is now in preparation, which it is confidently expected the legislature will pass, requiring the control of Anopheles breeding in impounded waters, both large and small, in the malaria sections of Virginia. The only other control measures used in rural communities are screening and the standard quinin treatment.

Urban.—New urban control and maintenance of control done in the past has continued rather successfully. Only one town is known to have ceased maintenance, and, when later in the season a number of malaria cases appeared, maintenance was very promptly resumed. The methods used for town control remain the same, drainage, oil-soaked sawdust, screening, paris green, and the standard quinin treatment.

Maintenance of old work and new mosquito control has been put under the supervision of the county health departments with general direction by the Malaria Bureau. In counties without health departments the Malaria Bureau advises and recommends methods of control.

All malaria activities in the State of Virginia are carried out through the county health departments under the direction of the Malaria Bureau except special investigations and surveys, and recommendations made in counties which do not have full-time county health departments, and these are made by the Malaria Bureau.

MALARIA PROGRAM FOR 1926

(1) To secure legislative action for the control of impounded waters.

(2) Locating of all impounded waters in the malaria sections of Virginia (of all sizes) and making malaria history indices of these sections. This work will be done by the health officer in counties having county health departments and in the other sections by the Malaria Bureau.

(3) Field station studies of specially selected places will be continued as a means of holding the interest of the health officer and the citizens in the counties having county health departments.

(4) To secure better reporting of malaria through closer cooperation of the physician and health officers. This is to be done by having the health officer become a member of the county medical society and act as its secretary.

(5) To have a regular bi-monthly meeting of the county boards of health, and the securing of their endorsement and personal efforts to induce the physicians to report malaria cases promptly.

(6) Urban mosquito control is to be continued as in previous years. In rural work the only efforts will be for the control of the breeding of quadrimaculatus, as our studies of 1925 have convinced us more than

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ever that quadrimaculatus is the only malaria carrying mosquito of importance in Virginia.

(7) Educational work will be continued through the schools and by lectures, exhibits, distribution of literature, newspaper publicity and moving pictures.

MALARIA CONTROL ACTIVITIES IN TEXAS*

By H. O. SAPPINGTON, M.D.,
State Health Officer,
Austin, Tex.

This past year witnessed an increase in the interests of malaria control on the part of the Texas population and increasing activities in the control of the disease carrying mosquito on the part of the incorporated towns and cities of this State. More than 100 cities in Texas adopted the malaria control program, of which approximately 50 per cent secured good results, while in the remaining towns the work was executed more or less sporadically.

The population in the urban districts protected was 923,700 at a cost of $49,440.00, paid by the communities; or a per capita cost of six cents. There were 32 full-time inspectors employed by the cities, and 62 part-time inspectors employed by as many cities.

The State Board of Health had one malaria engineer in charge of this work, and three district engineers who gave part of their time to the work, while during the summer season four medical students were employed to assist in the supervision work in the various towns. The amount of money expended on this work by the state was as follows:

By State Appropriation	$10,000.00
From other sources	3,000.00
	$13,000.00

Work in the rural districts was carried on by a full-time inspector, financed in Caldwell County, and by the full-time county unit in Hidalgo and Falls Counties. The State Board of Health was interested in assisting and securing the drainage of some 14,000 acres of land in the Trinity River bottoms, and interested the State Game, Fish and Oyster Commission to propagate gambusia affinis minnows for distribution to municipal hatcheries. The Cotton Belt Railroad carried on its regular routine mosquito program in some fifteen towns along its Texas lines as in former years. The Rock Island has also taken the initiative along this line. The enactment of mosquito ordinances by twelve municipalities was obtained during the year.

Malaria cases reported to the State Board of Health are as follows:

The last eight months of	1920	48,115 cases
The year of	1921	49,256 cases
The year of	1922	35,584 cases
The year of	1923	21,268 cases
The year of	1924	16,068 cases
The first nine months of	1925	9,299 cases

These reports are obtained by mailing out cards to the physicians in the malaria belt on the first of each month, and it is noted that better responses in reporting are obtained from the physicians each year. It is estimated that at the present time approximately 35 per cent of the cases are reported.

Deaths from malaria that have been reported are as follows:

The year of	1920	528 deaths
The year of	1921	523 deaths
The year of	1922	290 deaths
The year of	1923	160 deaths
The year of	1924	141 deaths
The year of	1925	191 deaths

EDUCATIONAL ACTIVITIES

The State Board of Health sponsored a short school for Sanitarians at which time inspectors and health workers were given instructions on identification and control of mosquitoes. The State Board of Health interested the A. and M. College to offer a course in sanitary engineering, including in that course the study of Hardenburg's book, "Mosquito Eradication," and lectures on mosquito control. The Trinity River Reclamation and Conservation District has been organized, embracing representatives of 40 cities and 34 counties along the Trinity River, which organization has for one of its purposes the drainage of some 700,000 acres of land subject to overflow along the Trinity River, and making this area more habitable for man, and minimizing the malaria menace.

Thirty-six tourist camps have been approved by the Texas State Board of Health, and it is one of the requirements for approval that the tourist camp be free from mosquito breeding places.

Approximately 50 lectures on mosquito control were given; 40 news items prepared, issued and printed; the mosquito film was shown 20 times; a thousand or more letters were written on the subject, and approximately 20,000 pieces of literature and placards were distributed.

In addition to the above work, the mosquito control activities with reference to yellow fever control carried on along the Mexican border cooperatively by the U. S. Public Health Service, the Texas State Board of Health and border communities, are not included.

The excellent results secured in the past season are partially due to the unusually dry weather in some of our heavily infected malaria counties.

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MALARIA MOSQUITO CONTROL IN ILLINOIS*

By ISAAC D. RAWLINGS, M.S., M.D.,
Director, Illinois Department of Public Health, Springfield, Ill.

Organization.—Malaria control activities are carried on subject to the Director's approval by the Division of Sanitary Engineering. Two assistant engineers were assigned part time to the work which required approximately the equivalent of one engineer's full time for 12 months. One engineer was stationed at Carbondale in the "malaria belt" to exercise close supervision over the work.

Review of Malaria and Mosquito Control Activities. Visits and surveys made at the following places (The number following the place indicates the number of visits made):

Belleville 4	Fairfield 1	Marion 1
Carbondale 23	Glencoe 4	Murphysboro 34
DeKalb 1	Gorham 15	Ravinia Park 7
DeSoto 1	Herrin 9	W. Frankfort 24
Dowell 1	Johnston City 1	Winnetka 4

Conferences were held relative to control work at the following places (The number following the place indicates the number of conferences held):

Chicago Sanitary District.... 1	Highland Park..... 1
North Shore 1	Ravinia Park..... 3
Evanston 2	Herrin 4
DesPlaines River Area..... 1	Murphysboro 1
Glencoe 2	Winnetka 4

Sixty letters were written relative to malaria and mosquito control.

Educational Measures.—Addresses were made in public schools in towns where malaria projects were in progress. Newspaper publicity was secured and house-to-house canvasses were made in towns carrying on control work. Two pamphlets on "Mosquitoes and Malaria" were prepared and are being distributed to interested persons.

Prevalence of Malaria.—An average of 80 deaths from malaria occur annually in Illinois, 60 per cent of which occur in the southern 12 counties which represent only about 5 per cent of the total population of the state. Malaria cases and deaths are supposed to be reported to the Department of Public Health, but case reports are very incomplete and give no index of the incidence of malaria. Case rates from 2 to 6 per cent of the population are common in many southern Illinois cities.

Control Projects.—Control of rural malaria or malaria control on county-wide basis has not yet been undertaken. Jackson county, where 50 per cent of the population has been actually served by malaria control projects will probably be the first county where such work may be taken up on a county-wide basis. All control projects thus far supervised have been demonstrational projects. A list of the projects in progress during 1925 and data applying thereto is given below.

The state ordinarily does not subsidize or finance control projects. However, in 1925, a special appropriation of $500,000 was made for the relief of southern Illinois tornado sufferers and a portion of this money was secured for carrying on malaria control at Murphysboro, West Frankfort and Gorham.

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Book Reviews

Modern Medicine, Its Theory and Practice in Original Contributions by American and Foreign Authors. Edited by Sir William Osler, Bart, M.D., F.R.S., Late Regius Professor of Medicine in Oxford University, England; Honorary Professor of Medicine in the Johns Hopkins University, Baltimore; Formerly Professor of Clinical Medicine in the University of Pennsylvania, Philadelphia, and of the Institutes of Medicine in McGill University, Montreal, Canada. Third Edition, thoroughly revised, and re-edited by Thomas McCrae, M.D., Professor of Medicine, Jefferson Medical College, Philadelphia; Fellow Royal College of Physicians, London; Formerly Associate Professor of Medicine, Johns Hopkins University, Baltimore, assisted by Elmer H. Funk, M.D., Assistant Professor of Medicine, Jefferson Medical College, Philadelphia. Volumes I and II, illustrated. Philadelphia and London: Lea and Febiger, 1925. Cloth, $9.00 each.

Volume I deals with "Bacterial Diseases; Non-Bacterial Fungus Infections; the Mycoses," and Volume II comprises "Diseases of Doubtful Etiology; Diseases Caused by Protozoa, Spirochetes and Animal Parasites; Diseases Due to Physical, Chemical and Organic Agents, and Deficiency Diseases."

It would be impossible to do justice in a brief review to the excellence of this system of medicine first published by the late Sir William Osler, over eighteen years ago. Dr. McCrae, the nephew-in-law, and long-time associate of Sir William, has caught the spirit of Osler in all that he has added and revised. No more popular system was ever published or deserved its popularity more than this. These first two volumes that have appeared in the third edition are in every way worthy of the reputation their predecessors have made.

A Classification of the Tumors of the Glioma Group on a Histogenetic Basis with a Correlated Study of Prognosis. By Percival Bailey and Harvey Cushing, from the Surgical Clinic and Laboratory of the Peter Bent Brigham Hospital and the Laboratory of Surgical Research of the Harvard Medical School, Boston, Mass. 175 pages with 108 illustrations. Philadelphia: J. B. Lippincott Company, 1926.

Gliomas are said to make up 40 per cent of all brain tumors. This book is the result of a study of 414 gliomas, and 167 autopsy specimens. It is an attempt to classify and differentiate these tumors in such a way as to bring out conclusions as to prognosis. No man is better able to do this than Dr. Cushing, who is the dean of brain surgeons of America. There is a "Clinical Correlation" and at the end a "Summary and Conclusions."

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DR. M. Y. DABNEY, Editor
C. P. LORANZ, Secretary-Manager

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EDITORIAL DEPARTMENT

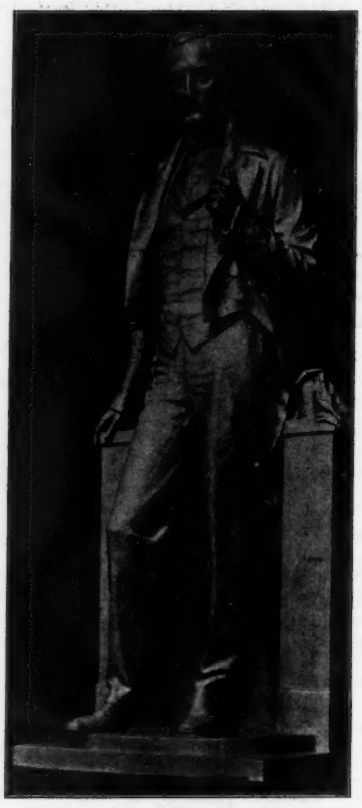
SOUTHERN MEDICAL ASSOCIATION
Twentieth Annual Meeting
Atlanta, Georgia, November 15-18, 1926

UNVEILING OF THE MONUMENT TO CRAWFORD W. LONG

In 1921, an editorial in the JOURNAL entitled "Morton, the Impostor, in the Hall of Fame," called attention to the fact that the real discoverer of anesthesia was in some quarters unknown, and that elsewhere his mantle was being worn.

At the Association's meeting in 1921, a committee consisting of one physician from each state was appointed to investigate and study thoroughly all claims to the honor of the discovery, that medical history of this subject might not be falsified for future generations. The committee, whose Chairman was Dr. Frank K. Boland, of Atlanta, reported in 1922 after a consideration of all available literature on the subject that unmistakable proof was adduced "that Crawford W. Long and none other was the discoverer of anesthesia and is entitled to the credit and honor for an achievement of such inestimable benefit to medicine and to humanity."

In March of the current year invitations were extended by the Crawford W. Long Memorial Association, of which Dr. Boland has been the very capable President, to the unveiling of the statue of Crawford Williamson Long, the discoverer of ether anesthesia, in Statuary Hall,



National Capitol, Washington, D. C. The statue by John Massey Rhind is a splendid piece of sculpture.

Stirring addresses were made, and beautiful flowers were sent by a number of individuals and organizations. The Southern Medical Journal was officially represented at the unveiling by a committee of five as follows: Dr. J. Russell Verbycke, Jr., Dr. Thomas A. Groover, Dr. H. H. Kerr, Dr. William T. Davis and Dr. Jos. B. Bogan, all of Washington.

The statue of Long is being offered by the State of Georgia to the Statuary Hall as that of one of its two greatest sons. The other is Alexander H. Stephens. Strangely enough they were roommates at the University of Georgia.

Thus after eighty-four years, this country physician, one of the greatest benefactors of suf-

fering men and women, has received public and official recognition. Georgia may well be proud both of Long, and of the men of this generation who have fought to attach to his name the fame which he so much and so clearly deserves.

TREND OF MALARIA IN THE UNITED STATES

Many volumes have been written with the purpose of portraying and preserving different aspects of early life on the American continent. Historians, novelists, and now motion pictures, have found in this moving caravan of Indians, trappers, hunters, herds of buffalo, Western mining camps, and longhorn cattle, most attractive themes, full of color and overflowing with action. But not every phase of pioneer America presents this same dramatic interest and lends itself so happily to pictures for future generations, for no epic has yet been written of "The Vanishing Vivax" or "The Passing of Plasmoium Falciparum." These events, less spectacular, are historically as interesting and economically of far greater importance to America than the fate of the Indian and buffalo of the Western plains.

The reduction in malaria which has taken place in the United States within recent years is no longer a vaguely rumored hearsay. It is being actually measured and can be definitely shown by morbidity and mortality figures collected in many states by the different health departments. Malaria has ceased to be of any public health importance north of the Ohio River, and in every Southern state extensive areas are now malaria free. Also the type of the disease, on the whole, is much milder than it was during the past century. Black water fever and those rapidly fatal cases of malaria known as "congestive chills" are now rarely encountered.

At the malaria sessions of the last Southern Medical Association meeting this wide-spread reduction and amelioration of malaria was a subject of general discussion and congratulation. Hoffman quoted authentic figures showing a reduction of fifty per cent in the malaria rate of the Delta region of Mississippi during the past ten years. Maxcy, from available figures collected recently in the Southern states, concludes that if the present reduction rate continues malaria will cease to be of public health importance to the United States in something less than fifty years. Should the conditions which are causing malaria reduction remain nearly constant, however, its decline will be increasingly accelerated as the number of malaria carriers decreases and the end may come sooner than is expected.

Yellow fever has gone and malaria is following more or less rapidly. These facts should be published throughout the United States. At the same time a false assumption, sometimes heard expressed, should be corrected before it has become current and passed into history as true. It is assumed by some that malaria reduction in the South is due entirely to improvements in economic conditions, such as better houses, better roads, and increased land values. No credit is given the physician and public health officer for their untiring efforts to make well and keep well the people of the South. Assuredly, economic improvement has played a part in malaria reduction, but a minor one as compared with the effective cure of malaria carriers, the education of the public in malaria transmission, and the application of malaria control measures by those whose duty and privilege it is to know and to do these things.

The natural corollary following this false assumption would be to throw physic and the physician to the dogs, disregard and discredit the health officer, adopt a *laissez faire* attitude toward malaria only to wake up and find that a woeful mistake had been made and that the malaria situation had grown worse instead of better.

Malaria can be eliminated from the South but not without thought and effort on the part of the physician, the public health officer, and the people themselves.

TREATMENT OF MALIGNANT GROWTHS WITH COLLOIDAL LEAD

Coincident with the visit to this country from England of W. Blair Bell, much attention has been directed to his experimental work upon the effect of intravenous injection of colloidal lead upon malignant growths. In the last few years Bell has treated a number of patients with advanced degrees of malignancy to an apparent clinical cure. He has treated many others whom he has failed to cure, or whose end he has hastened. The few "cures," however, have been sufficiently authenticated and sufficiently striking to attract much attention, and pressure has been brought to bear upon Bell to allow his lead preparation to be used by physicians elsewhere. On account of the instability of the solution, its admitted toxicity, and the very large number of cases which it has failed to improve, he has refused to give any of it out for administration without his supervision, giving as a reason that:

"Although we believe that lead is of great value in the treatment of malignant disease, either alone or in conjunction with other methods of treatment, we realize not only that it is but a substitute for something better, but also that the preparation made is far from perfect . . . . We have no doubt whatever that, if lead were to come into the hands of all those who are clamoring for our preparation, the whole method would be condemned as useless."

It has been shown by Bell that chorionic tissue and tumor tissue absorb lead from the blood stream selectively and more rapidly than other living tissues, and are then destroyed by the absorbed lead. This demonstrable fact is the basis for his therapeutic attempts. A vast amount of work has been done by chemists to produce a non-toxic and therapeutically active form of lead. A recent paper reviews all the cases in which the method has up to the present been tried.[1]

The first case was treated nearly six years ago, and in all now 227 patients, usually in hopeless stages of the disease, have received injections.

Of these, 106 died after treatment, 50 died before treatment was complete; in 10 cases the disease was considered "completely arrested," and 31 were "believed cured." Of course, no great amount of time has elapsed since the treatments. A few cases died from too rapid absorption of the destroyed tumor. Others have received the treatments too recently for a judgment to be made.

Dr. J. G. Adami, the distinguished pathologist, commenting upon Dr. Bell's "cured" cases, many of whom he has observed from the beginning of treatment, notes the healthy appearance of the majority of them, the absence of cachexia, absence of signs of lead poisoning, the improvement in weight and bodily condition of the patients and their ability to engage in active occupations, and the absence of evidence of recurrence which is commonly observed after the employment of x-ray or radium. The mortality of sixty per cent, he says, is to be considered as a material reduction from a mortality of, say, ninety-five per cent.

Bell's results in no way dispute the value of surgical treatment, or radiation, or the preventive importance of early diagnosis. He uses surgery and x-ray in conjunction with his lead injections. Nor does he make any "claim whatsoever in regard to the general curability of cancer by the use of lead." Other methods of treatment, such as extensive surgery, deep x-ray therapy, sero-therapy, have given results which were as encouraging in the past. The lead effect is possibly more capable than these of study and improvement.

The research is of value at present not primarily clinically but for the light which it sheds upon tumor chemistry. Normal and malignant tissues have been shown to differ in their sugar content, in their enzyme content, in their content of a growth-stimulating principle, in the rapidity with which they absorb x-ray and radium emanation and colloidal lead. The problem of malignancy has perhaps consumed more of the working hours of medical scientists than has any other question. In the course of time, in the intensive study of the properties of malignant growths, a practical method of destroying them *in vivo* will be found.

1. Bell, W. B., Woolfenden, H. F., Cunningham, L., and Herd, S. B., with comment by Adami, J. G.: Treatment of Malignant Disease with Lead. Lancet, 210, p. 537, March 13, 1926.

Southern Medical News

ALABAMA

Deaths

Dr. Mack Rogers, Birmingham, aged 61, died March 20, at a hospital in Excelsior Springs, Mo., of heart disease.

Dr. John Hodges Drake, Sr., Auburn, aged 80, died suddenly February 5 of heart disease.

ARKANSAS

Phillips County Medical Society has elected the following officers: Dr. W. C. Russwurm, President; Dr. Geo. R. Storm, Vice-President; Dr. M. Fink, re-elected Secretary-Treasurer.

Searcy County Medical Society has elected Dr. E. G. Fendley, President; Dr. J. A. Henley, Vice-President; Dr. Sam G. Daniel, re-elected Secretary.

The Woman's Auxiliary to the Hot Springs-Garland County Medical Society was organized February 10. The following officers were elected: Mrs. C. T. Drennen, President; Mrs. G. E. Tarkington, Vice-President; Mrs. Lloyd Thompson, Recording Secretary; Mrs. E. R. Browning, Corresponding Secretary; Mrs. P. Z. Browne, Treasurer.

The First Councilor District and North East Arkansas Medical Society met at Jonesboro, April 14, and was entertained by the Craighead County Medical Society. The officers are Dr. Frank Nisbitt, Brookland, President; Dr. J. H. Lamb, Paragould, Vice-President; Dr. Thad Cothern, Jonesboro, Councilor and Acting Secretary.

Dr. Ira Fulton Jones and Miss Mary Virginia Norris, both of Fort Smith, were married February 12.

Deaths

Dr. George F. Reiser, Ramsey, aged 60, died February 13.

Dr. Keith E. Hudson, Charleston, aged 72, died February 7, of pneumonia.

Dr. Needham Harvey Grady, Hot Springs, aged 73, died February 24 at a hospital in St. Louis, Mo., of chronic nephritis and heart disease.

Dr. Annie Hays, Clarksville, aged 63, died February 24 at St. David's Hospital, Austin, Tex.

Dr. William J. Hornbarger, Heber Springs, aged 66, died February 26.

Dr. William L. Newton, Camden, aged 50, died February 26 of heart disease.

DISTRICT OF COLUMBIA

The Streets and Avenues Committee of the Washington Board of Trade has asked that the Walter Reed General Hospital be removed to an outlying section of the city if its present location prevented the extension of Fourteenth Street. By the sale of the present hospital building and site, enough money would be realized to purchase several times as much ground in the suburbs.

Deaths

Dr. Robert Edward Lee Newberne, Washington, aged 53, died February 15 at Phoenix, Ariz., of cerebral hemorrhage.

FLORIDA

The Duval County Hospital, Jacksonville, was opened recently. This is a general hospital of 230 beds, erected at a cost of $500,000, and financed by a three-mill tax. One-half of the beds are devoted to the tuberculosis section. Dr. John E. Boyd is President of the staff, and Mr. Fred M. Walker, Alliance, Ohio, is Superintendent.

Jacksonville is assured of another modern hospital. It is understood that $500,000 is to be expended in the erection of a new plant for St. Vincent's Hospital.

The first Infant Welfare Station in Florida was recently opened in Jacksonville. This work is in charge of Dr. Thomas E. Buckman. The City Health Officer, Dr. Noble A. Upchurch, plans to maintain several other stations in the city along the line of preventive pediatrics.

At a benefit performance of "Zeigfeld's Palm Beach Nights," March 8, more than $100,000 was raised for the Good Samaritan Hospital of West Palm Beach.

George E. Sebring, Sr., has offered to donate $10,000 toward a fund to erect a $150,000 hospital in Sebring, provided enough other citizens are willing to subscribe funds.

Dr. R. W. Browne, formerly of Norfolk, Va., has been transferred from Lake City, to the U. S. Veterans Hospital No. 65, St. Paul, Minn.

Dr. Francis Bartow Ennels and Miss Marjorie Sawyer, both of Jacksonville, were married March 3.

Deaths

Dr. J. Brown Wallace, Tampa, aged 52, died December 31 of pneumonia.

Dr. John Stillwell Wells, Miami, aged 57, died February 11, following a long illness.

Dr. James Harry Walters, Ocala, aged 41, died February 23 at a local hospital of pneumonia.

GEORGIA

Campbell County Medical Society has elected Dr. A. J. Greene, Union City, President; Dr. R. T. Camp, Fairburn, Secretary-Treasurer.

Cobb County Medical Society has elected Dr. F. P. Lindley, President; Dr. J. E. Lester, Kennesaw, Vice-President; Dr. R. W. Fowler, Marietta, Secretary-Treasurer.

Coffee County Medical Society has elected Dr. W. F. Sibbett, Douglas, President; Dr. H. C. Welchel, Douglas, Vice-President; Dr. T. H. Clark, Douglas, Secretary-Treasurer.

Evans County Medical Society has elected Dr. B. E. Miller, Claxton, President; Dr. D. S. Clanton, Hagan, Secretary-Treasurer.

Hart County Medical Society has elected Dr. Geo. S. Clark, Hartwell, President; Dr. J. I. Jenkins, Bowman, Vice-President; Dr. A. O. Meredith, Hartwell, Secretary-Treasurer.

Irwin County Medical Society has elected Dr. S. L. McElroy, Ocilla, President; Dr. J. C. Luke, Ocilla, Vice-President; Dr. G. W. Willis, Ocilla, Secretary-Treasurer.

Rabun County Medical Society has elected Dr. L. Neville, Dillard, President; Dr. J. C. Dover, Clayton, Vice-President Dr. J. A. Green, Clayton, Secretary-Treasurer.

Stewart-Webster Counties Medical Society has elected Dr. G. G. Lunsford, Weston, President; Dr. J. H. Foster, Preston, Vice-President; Dr. Milton Walton, Lumpkin, Secretary-Treasurer.

The Woman's Auxiliary of the Clarke County Medical Society has elected Mrs. P. L. Holliday, President; Mrs. W. H. Cabaniss, Vice-President; Mrs. H. M. Fullilove, Secretary-Treasurer.

The First District Medical Society met in Millen February 16. Dr. H. H. McGee resigned as Secretary-Treasurer, and is succeeded by Dr. W. V. Long, Savannah.

The Georgia Baptist Hospital, Atlanta, has appointed the following on its staff: Dr. J. D. Manget, President; Dr. Frank Wells and Dr. W. A. Selman, Vice-Presidents; Dr. Allen H. Bunce, Secretary.

The Shrine is spending about one million dollars a year for building, maintaining and adding to their equipment for their hospital for crippled children.

Dr. Wallace Mathews, Quitman, has been elected Physician for Brooks county.

Dr. Emmett B. Anderson, Americus, has been elected Physician of Sumter County to succeed Dr. F. L. Cato, Americus, resigned.

It is reported that the Mayor and City Council of LaGrange are considering a levy of one cent per gallon tax on gas for the purpose of paying the indebtedness of the City Hospital.

Dr. T. R. Aycock, Walton County, has been in charge of the baby conferences at the Monroe Hospital for examination of children.

Dr. D. P. Luke, Secretary of Mitchell County Medical Society, recently arranged a free clinic for diagnosis and treatment of any disease known to the people of his section. The clinic was held at Camilla, and was fostered by Emory University.

Dr. W. E. Person, Atlanta, has been elected President of the Association of Medical and Dental Officers of the U. S. Army.

The Kiwanians of Savannah are planning the construction of a fresh air unit.

Dr. T. F. Abercrombie, Commissioner of Health and Secretary of the State Board of Health, was recently appointed a member of the Committee on

Public Policy and Legislation for a three-year term, to succeed the late Dr. B. H. Wagnon.

Dr. J. Render Anthony, Medical Director of the Griffin Hospital, reports that last year was the most successful the institution has ever had. Five hundred and fifty-eight patients were treated.

Dr. C. M. Curtis, College Park, has been elected Vice-President of the Surgical Association of the Atlanta and West Point Railroad, the Western Railway of Alabama, the Central of Georgia Railroad, and the Elberton and Eastern Railroad. The following is the new Executive Board for these railroads: Dr. J. R. Garner, Atlanta, Chairman; Dr. Enoch Calloway, LaGrange; Dr. Willis Jones, Atlanta: Dr. E. E. Murphey, Augusta.

Dr. George T. Olmstead has been elected Medical Director of the Savannah Hospital to succeed Dr. R. V. Martin. Dr. Charles Usher was re-elected Chief of the Staff.

Dr. Powell Allen, Milledgeville, and Miss Alma Falbeau, New York, N. Y., were married in Milledgeville recently.

Deaths

Dr. Henry Morton Hall, Cedartown, aged 56, died March 14 of myocarditis.

Dr. James L. Lovvorn, Bowdon, aged 63, died February 8, following a long illness.

Dr. Thomas Slater Jones, Jeffersonville, aged 61, died February 17 at a sanatorium in Macon of pneumonia, following influenza.

Dr. Henry Fauntleroy Harris, Atlanta, aged 59, died March 18 at the Jefferson Hospital, Philadelphia, of paralysis.

Dr. George H. Lehmann, Augusta, aged 51, died February 14.

Dr. Thomas J. Phillips, Griffin, aged 53, died February 20 of a self-inflicted bullet wound.

Dr. Sterling Gibson, Thomson, aged 67, died February 16.

Dr. John Cheston King, Atlanta, aged 60, died February 7 at the Wesley Memorial Hospital, of nephritis, uremia and chronic myocarditis.

KENTUCKY

At a recent meeting of the new Board of Health of Henderson, Dr. George F. Jones was elected President and Dr. James U. Ridley, City Health Officer. The other members of the Board are Dr. William V. Neel and Dr. Jesse O. Strother.

The Pikeville General Hospital and the Methodist Hospital, Pikeville, have merged. The patients of the General Hospital are being moved to the Methodist Hospital.

The Madison County Medical Society held a tuberculosis clinic at Berea, February 25. Dr. James S. Lock of the Bureau of Tuberculosis of the State Board of Health, Louisville, assisted the local physicians.

Dr. John C. Morrison, Paducah, has resigned as head of the Public Health Work in the City.

Miss Lake Johnson, formerly in charge of St. Mary's Hospital, Athens, Ga., has been selected as Superintendent of the Good Samaritan Hospital, Lexington, to succeed Miss Alberta Dozier.

Dr. **Henry H. Bishop, Louisville, has resigned** from the staff of the Urologic Department of the City Hospital.

Dr. Daniel H. Kash, Jackson, has been made physician **to a coal camp at Blue Diamond.**

Dr. Isaac J. Townes, Madisonville, and Miss Laura E. Hoffman, Mayfield, were married March 11.

Deaths

Dr. Thomas G. Turner, Dunmor, aged 70, died February 5.

Dr. Eugene Yates Johnson, Louisville, aged 64, died February 19 of pneumonia.

Dr. John Warren Holt, Eminence, aged 54, was found dead in bed, March 2 of chloroform poisoning.

Dr. Seymour M. Hopkins, De Mossville, aged 69, died February 15 at the Good Samaritan Hospital, Cincinnati, Ohio.

LOUISIANA

Iberia Paris Medical Society has elected Dr. P. H. Boykin, Jeanerette, President; Dr. H. H. King, New Iberia, Vice-President; Dr. W. F. Carstens, New Iberia, Secretary-Treasurer.

The Sixth District Medical Society held its eighth annual meeting at Baton Rouge, March 25. The following officers were elected: Dr. Robert B. Wallace, Baton Rouge, President; Vice-Presidents: Ascension Parish, Dr. T. H. Hanson, Donaldsonville; East Baton Rouge Parish, Dr. T. J. McHugh, Baton Rouge; East Feliciana Parish, Dr. E. M. Toler, Clinton; Iberville Parish, Dr. B. O. LeBlanc, St. Gabriel; Livingston Parish, Dr. N. T. Bray, Springfield; Pointe Coupee Parish, Dr. M. O. Becnel, New Roads; St. Helena Parish, Dr. A. J. Newman, Montpelia; St. Tammany Parish, Dr. A. G. Maylie, Covington; Tangipahoa Parish, Dr. Lucius McGehee, Hammond; Washington Parish, Dr. J. H. Slaughter, Bogalusa; West Baton Rouge Parish, Dr. J. H. McCaa, Chamberlin; West Feliciana Parish, Dr. A. F. Barrow, St. Francisville; Secretary-Treasurer, Dr. Thomas C. Paulsen, Baton Rouge.

St. Mary Parish Medical Society has elected Dr. L. B. Crawford, Patterson, President; Dr. D. A. C. Kappel, Franklin, Secretary-Treasurer.

Third District Medical Society met in New Iberia, March 11. The following officers were elected: Dr. J. G. F. Edwards, Lafayette, President; Dr. H. A. Eldredge, Abbeville, Vice-President; Dr. R. D. Voorhies, Lafayette, Secretary-Treasurer.

Vermillion Parish Medical Society has elected Dr. G. L. Gardiner, Gueydan, President; Dr. A. A. Comeaux, Abbeville, Vice-President; Dr. Thomas Latiolais, Kaplan, Secretary-Treasurer.

The Shreveport Charity Hospital Staff, at its March meeting, selected Dr. S. C. Barrow, Chairman; Dr. J. K. Heard, Secretary.

A committee of the Shreveport Medical Society, of which Dr. G. A. Caldwell is Chairman, is arranging for an up-to-date medical library for Shreveport, which will be housed in a part of the Shreveport Memorial Library.

Dr. Leonard C. Chamberlain has been elected President of the Clinical Staff of the Presbyterian Hospital, New Orleans. He succeeds Dr. Euclid J. Richard.

Dr. Carleton Simon, formerly Deputy Police Commissioner of New York City, is in New Orleans to survey the narcotic situation in the state.

Dr. David A. Hines, Collector of Internal Revenue for the Department of Louisiana, has resigned, and will engage in the practice of medicine.

Dr. Francis M. Munson, New Orleans, has taken up the duties of Health Officer of Sioux Falls, S. D.

Dr. David E. Brown, Chatham, has been appointed Director of Tuberculosis Control of the Louisiana State Board of Health.

Dr. Edward Harold Mauer and Miss Anna Felice Egan, both of New Orleans, were married February 10.

Deaths

Dr. Clarence Gabriel Perot, Campti, aged 43, died February 8 of heart disease.

Dr. William Andrews Stevenson, Oil City, aged 48, died February 23, at a sanatorium in Shreveport.

Dr. James Crowe Burdett, Evelyn, aged 49, died February 16 at the Mansfield Sanitarium, Mansfield.

Dr. Abraham Nelken, New Orleans, aged 49, died February 23.

Dr. William Wunderlich, New Orleans, aged 66, died February 18.

Dr. Webster Smith, Colfax, aged 65, died suddenly November 24.

MARYLAND

The American College of Surgeons, Maryland, Virginia, West Virginia and District of Columbia Section, held its annual meeting in Cumberland, March 2-3.

A reunion to celebrate the fiftieth anniversary of the graduation of the class of 1876 of the University of Maryland Medical School, was held February 27 in Baltimore. Of the seven members of the class, five were present. Those in attendance were Drs. Wilmer Brinton, Thomas C. Worthington, William E. Weigand and William H. Marsh, all of Baltimore, and Dr. James F. H. Gorsuch, Fork. Those unable to be present were Dr. Samuel J. Belt, Baltimore, now 82 years old, and Dr. David W. Smouse, who lives in Des Moines, Iowa.

Dr. Robert H. Riley, Acting Director of the State Department of Health, is making a study of state health work in North and South Carolina, Alabama and Tennessee.

Dr. Bernard Philip Herzog has been appointed

(Continued on page 34)

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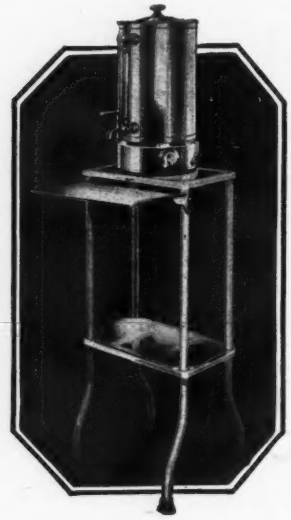

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(Continued from page 412)

Medical Examiner to the Board of Pension Trustees of Baltimore. Other members of the staff are Drs. Frank S. Hundley and Andrew Kunkowski.

Dr. Charles C. Hedges, U. S. Public Health Director for Marshall County, W. Va., has accepted the position of Second Assistant Director at the Johns Hopkins Hospital, and will be in charge of the dispensaries. He succeeded Albert W. Buck, who resigned to become Director of the New Haven Hospital, New Haven, Conn.

Dr. Daniel S. Fisher has been appointed Coroner for the Western District of Baltimore, succeeding Dr. Harry K. Forsuch, resigned.

Dr. Daniel O'Brien, of the Johns Hopkins Hospital, left Baltimore recently to join the Arctic aerial expedition in command of Lieut. Comdr. Richard E. Byrd, Jr., U. S. Navy, retired, which sailed from New York, April 2, for Spitzbergen.

Deaths

Dr. Christian R. Scheller, Hagerstown, aged 64, died March 5.

Dr. Henry Louis Perrie Naylor, Pikesville, aged 87, died February 19 of heart disease.

Dr. William Stump, Emmorton, aged 57, died February 3 of angina pectoris.

Dr. Charles Bagley, Bagley, aged 77, died February 13 of paralysis.

Dr. Solomon Lincoln Fairchild, Hagerstown, aged 42, died February 14 at the Hagerstown Hospital, of pneumonia.

MISSISSIPPI

DeSoto County Medical Society met March 1. The following officers were elected: Dr. D. C. Funderburke, Olive Branch, President; Dr. A. F. Weissinger, Hernando, Vice-President; Dr. L. L. Minor, Memphis, Tenn., re-elected Secretary-Treasurer. The Society meets every other month at Hernando.

Governor Whitfield signed the anti-evolution bill, March 11, enacting a law which prohibits the teaching in state supported schools of the theory that man descended from another form of animal life. The penalty for violation of the law is a fine of from $100 to $500, and revocation of the license of the teacher convicted.

Miss Julia Dainwood has been named Superintendent of the Mississippi Baptist Hospital, Jackson.

Deaths

Dr. Edward Reese Cook, Vicksburg, aged 69, died February 10.

MISSOURI

Benton County Medical Society has elected Dr. Samuel O. Stratton, Lincoln, President; Dr. Joseph M. Edwards, Cross Timbers, Vice-President; Dr. James A. Logan, Warsaw, re-elected Secretary-Treasurer.

Henry County Medical Society has elected Dr. G. S. Walker, Clinton, President; Dr. W. E. Baggerly, La Due, Vice-President; Dr. S. W. Woltzen, Clinton, Secretary-Treasurer.

Madison County Medical Society has elected Dr. C. U. Davis, Fredericktown, President; Dr. E. E. Higdon, Fredericktown, Vice-President; Dr. Harry Barron, Fredericktown, Secretary; Dr. M. B. Barger, Fredericktown, Treasurer.

Nodaway County Medical Society has elected Dr. Charles D. Humberd, Barnard, President; Dr. Horace S. Dowell, Maryville, Secretary.

Falls County Medical Society has re-elected the following officers: Dr. H. B. Norton, Center, President; Dr. T. J. Downing, New London, Secretary-Treasurer.

St. Charles County Medical Society has elected Dr. Thomas L. Hardin, St. Charles, re-elected President; Dr. B. Geret Gossow, St. Charles, Vice President; Dr. Leroy E. Belding, St. Charles, re-elected Secretary-Treasurer.

Saline County Medical Society has elected Dr. A. T. Coffman, President; Dr. G. S. Hardin, Vice-President; Dr. Fred A. Stahl, re-elected Secretary-Treasurer.

The Missouri Hospital Association will hold its annual meeting in St. Louis on May 17.

A fund is being raised as a memorial to Mr. Ernest

(Continued on page 36)

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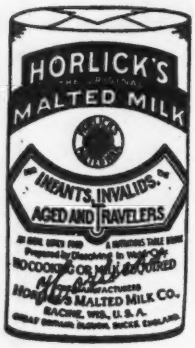

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RACINE, WISCONSIN

(Continued from page 34)

Harold Baynes who died January 21, 1925. The interest on the fund is to be used for the support and comfort of the widow. The principal at her death is to be transferred to the American Association for Medical Progress, an organization formed a few years ago to combat the activities of the anti-vivisectionists. Mr. Baynes devoted himself at a great sacrifice in an effort to combat the anti-vivisectionist propaganda. He had great influence in helping to defeat them.

Through the efforts of Mrs. Charles W. Greene, Columbia, Chairman of Child Welfare, Missouri Federation of Women's Clubs, arrangements have been made by which free treatment may be supplied the indigent crippled children of the state. The treatment will be given either in St. Louis or Kansas City and free transportation for child and attendant will be provided.

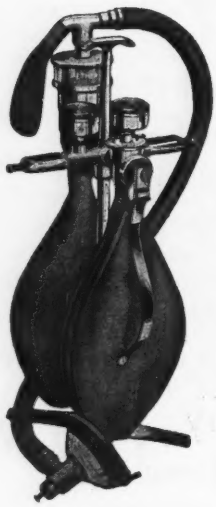
A committee of the Community Council of St. Louis is making a permanent list of donors for blood transfusion. Sixty-seven persons have responded to the call. It is hoped the list will be increased to 100, and that negroes as well as whites will volunteer. It is planned to give donors a fee of $25 Many have offered their services free of charge.

Providing the citizens of Sedalia subscribe $200,000 in stock for a new hotel to be erected in Sedalia, the Hon. J. H. Bothwell, Sedalia, has offered to purchase $50,000 in stock in the hotel. In addition Mr. Bothwell proposes to place in trust $100,000 in liberty bonds and will provide that at the time of his death the entire sum of $150,000 shall be used for the erection of a modern hospital at Sedalia. The income from these sums, during his life, will be paid to Mr. Bothwell.

A campaign is on to raise $5,000,000 for a new university in Kansas City to be known as the Lincoln and Lee University. The Methodist church is sponsoring this movement and will elect one-half of the members of the Board of Trustees, and other denominations will elect the remainder. One of the first departments to be established will be the medical department. Bishop E. L. Waldorf of the Kansas City District and the Methodist Episcopal church, is President of the Board of Trustees.

(Continued on page 38)

DO YOU NEED MONEY?



You can earn more and please your patients better with a McKesson Special to relieve pain in minor operations and obstetrics. It is automatic and inexpensive in operation.

Catalog and reprints give you many suggestions.

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2226-36 Ashland Ave.
Toledo, Ohio

WHERE KNOX SPARKLING GELATINE HAS PROVED HIGHLY EFFECTIVE

1. In infant feeding for full digestion of milk and the prevention of curds, regurgitation and vomiting.
2. For growth promotion in infant and child feeding.
3. In stubborn cases of malnutrition.
4. In the treatment of stomach disorders and intestinal putrefaction.
5. In the dietetic treatment of diabetes.
6. **In the dietary of tuberculosis patients.**
7. Whenever liquid and soft diets are essential.

*Reinforcing the Fighting Diet for Tuberculosis

THE protective colloidal ability of pure gelatine in preventing the curdling of the casein in milk by the enzyme rennin and hydrochloric acid of the gastric juices is most pronounced. **It increases the available recuperative energy of the milk by about 23%.**

This has been fully established by recognized authorities whose reports are available to the medical profession.

Knox Sparkling Gelatine, being prepared by exact methods under constant bacteriological control, and entirely free from sweetening, artificial coloring or flavoring, is especially recommended for this purpose.

KNOX SPARKLING GELATINE

"The Highest Quality for Health"

Method of Combining Gelatine with Milk

Add one teaspoonful of Knox Sparkling Gelatine—which should first be soaked in a little cold milk and dissolved over hot water or in hot milk—to the glass of milk. It will make the milk not only more digestible but more nourishing as well.

NOTE: In infant-feeding formulas use 1 tablespoonful of gelatine, dissolved as above, to the quart of milk.

Send This Coupon

Register your name with this coupon for the laboratory reports on the dietetic value of Knox Sparkling Gelatine

KNOX GELATINE LABORATORIES
408 Knox Avenue, Johnstown, N. Y.

Please register my name to receive, without charge, results of past laboratory tests with Knox Sparkling Gelatine, and future reports as they are issued.

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If you have not received our interesting catalogue, ask us for one. It is worthy of a place in your files.

Urological Instruments
In
Rubber and Gum

Ask your dealer

C. R. BARD, Inc.
37-39 East 28th St., New York

(Continued from page 36)

Plans are being made for the erection of a ten-story office building for St. Louis to be occupied exclusively by physicians and dentists of St. Louis. The building will include a small hospital and x-ray and pathological laboratories.

At a special session of the Missouri Conference of the Methodist Episcopal Church, which met in St. Joseph recently, plans were made to raise $300,000 for the Missouri Methodist Hospital, St. Joseph. The campaign will extend over a period of three years, the churches of St. Joseph raising $50,000 annually and the conference churches outside of St. Joseph raising a like sum.

Dr. James E. Stowers, Kansas City, has been appointed Fire Department Physician, succeeding Dr. C. E. Wilson, deceased.

Dr. H. I. Spector, St. Louis, has resigned his position as Tuberculosis Controller of St. Louis and will devote his time to private practice.

Miss Hilligrass has been made Superintendent of the University Hospital, Columbus.

Deaths

Dr. William A. Pease, Koshkonong, aged 67, died February 12 of heart disease.

Dr. Thomas J. Gibbs, Proctor, aged 71, died February 15.

Dr. Nimrod Polk Wood, Independence, aged 66, died February 23.

Dr. William Frick, Kansas City, aged 68, died February 19 of cerebral hemorrhage.

Dr. John L. Cassilly, St. Louis, aged 81, died February 21 of senility.

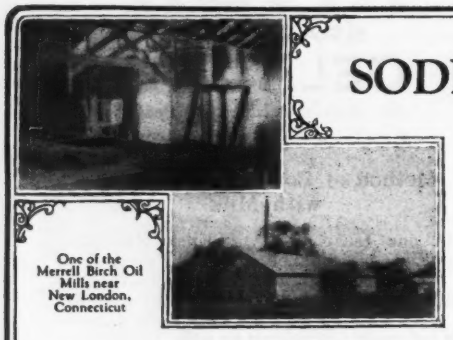
Dr. Thomas Henry Welsch, Hannibal, aged 43, was killed March 1 near Wentzville when the automobile in which he was driving went over an embankment.

Dr. Henry Croskey, Kansas City, aged 77, died February 19 at St. Luke's Hospital of cerebral hemorrhage.

Dr. Henry W. Kriege, St. Louis, aged 67, died February 27 of anemia.

Dr. John Benjamin Hancock, Newtonia, aged 61, died February 14 of uremia.

(Continued on page 40)



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SODIUM SALICYLATE
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SPECIFICATIONS for "true" or "natural" Sodium Salicylate usually fail of their purpose because of the widespread sophistication of the Birch Oil from which this product is supposedly made.

There is one specification, however, that when insisted upon by the physician will always insure the use of a salicylate from natural sources—SODIUM SALICYLATE Merrell.

To the physician who prefers salicylates from natural sources—

The Merrell Laboratory was the first in America to produce Salicylic Acid commercially from the natural oil.

Today it safeguards the integrity of its label by owning and operating the mills producing the Birch Oil from which Merrell's Salicylates are made.

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The Source of Potent Cod Liver Oil

Early in our work as pioneers in this country in the manufacture of dependable medicinal cod liver oil we found that much depended upon the source of the livers and we found no better livers anywhere than along our American shores.

We also found it necessary to control and directly supervise each step in the manufacturing process. This meant the establishment of plants directly at the source where our men collect the livers as soon as the fish are cleaned and promptly cook them to release the oil.

By improved methods of cooking, separating and chilling, developed in our plants, we produce an oil which requires no bleaching or chemical refining which might lessen the high vitamin potency.

This, briefly, is the history of PATCH'S FLAVORED COD LIVER OIL.

FOR YOUR PROTECTION

Nearly four years before the U. S. P. X Vitamin A assay became official, we were biologically testing each lot of PATCH'S FLAVORED COD LIVER OIL in our modern research laboratory.

How important that guarantee of vitamin potency is to you, when you are depending upon cod liver oil for real therapeutic value!

Less than one-half of one per cent of flavoring gives the oil a distinctive, pleasant flavor which your patient will always recognize as "just what the doctor ordered."
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Send me a sample of Patch's Flavored Cod Liver Oil with literature concerning its vitamin potency.

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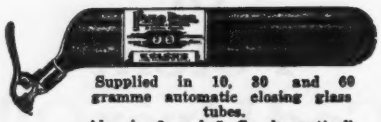
For Local and General
ANESTHESIA



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Also in 3 and 5 Cc. hermetically sealed glass tubes.

The automatic closing tubes require no valve. Simply press the lever.

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Sole distributors for the U. S. and Canada

MERCK & CO.
St. Louis **New York** Montreal

(Continued from page 38)

Dr. Charles H. Craig, Webb City, aged 68, died February 19 of pneumonia, following influenza.

Dr. James McComb, Lebanon, aged 93, died March 6.

Dr. John Bledsoe, Perry, aged 86, died December 27.

Dr. William John Kinder, Aldrich, aged 68, died at Springfield, February 19.

Dr. David O. Hudson, Montgomery City, aged 75, died at Columbia, March 12, of heart disease.

NORTH CAROLINA

The annual meeting of the North Carolina State Medical Association will be held in Wrightsville Beach June 15-17.

The Tri-State Medical Association (the Carolinas and Virginia) held its twenty-eighth annual meeting at Fayetteville February 16-17. Dr. Andrew J. Crowell, Charlotte, was elected President; Drs. Hugh R. Black, Spartanburg, S. C., Seavy Highsmith, Fayetteville, and Lawrence T. Price, Richmond, Va., Vice-Presidents; Dr. James K. Hall, Richmond, Va., Secretary-Treasurer.

The commissioners of Perquimans County recently voted to establish a County Health Department with a whole-time health officer in charge.

The Sarah Elizabeth Hospital, Henderson, was recently sold and is being converted into a hotel.

The City of Durham, under the auspices of the State Board of Health and the City and County, is having a complete malarial survey conducted, with a view to the elimination of that disease.

The Pitman Hospital, Fayetteville, will have a new $100,000 addition.

The patients at the State Tuberculosis Sanatorium, Montrose, are publishing a newspaper known as the Sanitarium Sun.

The $25,000 addition to the Angel Hospital, Franklin, was opened for patients May 1.

Dr. Jenness Morrill, Falkland, was recently appointed a member of the Board of Trustees of the State School for Deaf and Dumb, Morganton.

(Continued on page 42)

YOU KNOW FROM EXPERIENCE!

Summer Months Bring Feeding Troubles. Diarrhea, Enteritis and other Disorders are Prevalent, often Caused by Impure Milk Supplies.

(Dryco, the safe milk, eliminates the chance of milk-borne infection. Enviable international clinical history has established the fact that it can be depended upon for uniformity of quality and good results.)

SEND FOR DRYCO SAMPLES AND INTERESTING CLINICAL DATA.

The Dry Milk Company, 18 Park Row, New York, N. Y.

Send Dryco samples and clinical data.

Name.....M.D. Street.....

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The Cathartic Addict

Responsibility for the prevalent self-medication by cathartics lies largely at the door of the medical profession. The physician in general has not impressed on the public the fact that dosing with cathartics is more likely to cause constipation than to cure it.

The cathartic acts by chemical irritation. It hurts the bowel in order to cause a forceful, violent movement. As a result of the violent exertions, the muscles are fatigued, almost partially paralyzed, and lie inactive for twenty-four to forty-eight hours.

The logical method for treating constipation is a re-education of the bowel to move at a certain definite time every day. The physician must educate the patient to the necessity of this definite "Habit Time." He must instigate the correct regimen of diet and exercise.

To shorten the period of education, he can use a mechanical aid—PETROLAGAR (Deshell)—which provides a soft, oil-lubricated, bulky, easily passed stool.

PETROLAGAR (Deshell) is an emulsification of 65 per cent pure mineral oil (which is not digestible and not absorbable) and agar-agar (an indigestible, cellulose material, which absorbs moisture and increases its bulk).

PETROLAGAR (Deshell) has been accepted for New and Non-official Remedies by the Council on Pharmacy and Chemistry of the American Medical Association.

PETROLAGAR (Deshell) is issued as follows: PETROLAGAR (Plain); PETROLAGAR (with Phenolphthalein).

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Attach your dressing all around the wound for best protection.

For wounds on the scalp, face, neck and limbs, for burns and bruises where you want a dressing only where required, and without a cumbersome bandage use this liquid adhesive.

They won't slip or flap.

They come off without solvents.

It is very economical as only a very thin film is painted on the skin.

$2.00 Bottle

Send for literature

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THE BEST ONLY

SURGICAL, HOSPITAL AND LABORATORY SUPPLIES

MOBILE :—: ALABAMA

(Continued from page 40)

Miss Jessie Allen, New York, recently engaged by the Board of Directors of the Kingston City Hospital as Directress of Nurses at that institution, has succeeded Miss Martha Morningstar, who resigned to accept a position at St. Luke's Hospital, Newburgh.

Drs. Wm. DeB. MacNider, Charles L. Minor and J. Howell Way have been elected to fellowship in the American College of Physicians.

Dr. Joseph Rush Shull has been appointed Roentgenologist to the St. Peter's Hospital, Charlotte.

Dr. James P. Matheson was recently elected a director of the Charlotte Chamber of Commerce.

Miss Virginia Marshbanks has been appointed Superintendent of Rex Hospital, Raleigh.

Deaths

Dr. James M. Sloan, Gastonia, aged 55, died February 19 at Rochester, Minn.

Dr. E. L. Crumpler, Merry Hill, died February 20 of influenza and asthma.

Dr. Nelson Durant York, Mebane, aged 74, died February 25.

Dr. William Archibald Monroe, Sanford, aged 62, died February 26 of influenza.

Dr. Benjamin Franklin Falls, Cherryville, aged 70, died February 3 at Kings Mountain, of cerebral hemorrhage.

OKLAHOMA

The annual meeting of the Oklahoma State Medical Association will be held at Oklahoma City June 22-24.

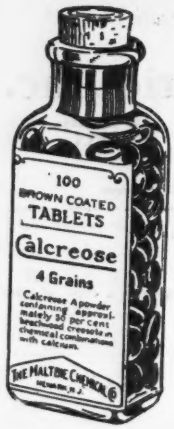
Kay County Medical Society has elected Dr. C. J. Barker, Kaw City, President; Dr. G. L. Berry, Blackwell, Vice-President; Dr. M. S. White, Blackwell, Secretary-Treasurer.

Logan County Medical Society has elected Dr. C. S. Petty, President; Dr. W. H. Larkin, Vice-President; Dr. E. O. Barker, Secretary-Treasurer.

Last fall at Oklahoma City a branch of a National Organization, known as the Oklahoma Society for the Care of Crippled Children, was organized. The financing for the preliminary work was made possible by a

(Continued on page 44)

CALCREOSE



Creosote Without its Faults

Wherever creosote is indicated in the treatment of pulmonary inflammations, such as colds, bronchitis, and tuberculosis, Calcreose can be used to advantage.

This loosely combined product of creosote and hydrated calcium oxide largely overcomes the gastric disturbance associated with the administration of creosote alone.

Slow absorption, toleration by sensitive stomachs, and the therapeutic advantages of both creosote and lime combine to make Calcreose a most effective remedy.

Calcreose can be given in large doses for long periods without apparent difficulty.

Powder: Tablets: Solution **Samples of Tablets on Request**

THE MALTBIE CHEMICAL COMPANY
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The Technique of Pollen Therapy

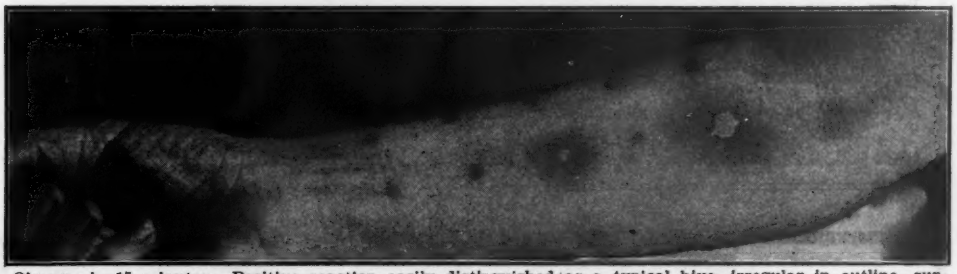
Testing.

Test Set. Capillary tubes containing extracts of various pollens (supplied without charge).

Scarify lightly with a needle, scalpel, or vaccinating chisel. 10 or 12 may be made on each forearm.

Apply contents of tubes on scarifications (same procedure as in smallpox vaccination).

Interpretation of Tests.



Observe in 15 minutes. Positive reaction easily distinguished as a typical hive, irregular in outline, surrounded by a zone of erythema. Refer to Geographical Chart (in each package). Choose for treatment most important pollen giving a marked positive reaction. If in doubt write The Cutter Laboratory, giving season of patient's symptoms and results of tests.

Treatment.

Treatment set. Dosage may be varied according to reaction (preferable) or a set schedule followed.

Withdraw solution from rubber capped vial. Dosage Chart in each package.

Inject subcutaneously on alternate days. Better results follow continuing treatment beyond 15th dose. Excess in each package.

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Please send me
☐ Your Hay Fever Booklet
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Dr. .....
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DIABETIC MUFFINS

Easily made in any home from *Listers* prepared casein Diabetic Flour. (Self-rising) Strictly free from Starch and Sugar.

Large Carton Flour *(30 days' supply)* $4.85

May be purchased from leading druggists or direct from

LISTER BROS., Inc. 405 Lexington Ave. NEW YORK CITY

(Continued from page 42)

liberal donation from Mr. Lew Wentz, Ponca City. The first object of the work is to make a survey of cripples of the State. This is being done by representatives of the Society, who visit the various counties and make arrangements for clinics. A clinic was held in Wagoner and Cherokee Counties February 26-27, at Wagoner and Tahlequah. These clinics were conducted by Drs. S. R. Cunningham, Oklahoma City, and Pat Fite, Muskogee.

Muskogee citizens have voted upon an offer of $100,000 from the Veterans Bureau for the City Hospital building, which adjoins the Veterans Hospital.

Dr. L. H. Carleton, formerly of Tulsa, has accepted an appointment to the Henry Ford Hospital, Detroit, Mich.

Miss Helen Wark, Kansas City, Mo., is the new Superintendent of the Washington County Memorial Hospital, Bartlesville. She succeeds Miss Katherine Rawson, who resigned. Miss Wark will also act as Superintendent of nurses at the hospital.

SOUTH CAROLINA

Laurens County Medical Society has elected Dr. J. W. Davis, Clinton, President; Dr. R. R. Walker, Laurens, Vice-President; Dr. J. L. Fennel, Waterloo, Secretary-Treasurer.

York County Medical Society has elected Dr. W. K. McGill, Clover, President; Dr. L. S. Hay, Rock Hill, Vice-President; Dr. W. C. Whitesides, York, Secretary-Treasurer.

Dr. Benjamin F. Wyman, Aiken, was recently appointed Director of the Department of Rural Sanitation of the State Board of Health, to succeed Dr. Luther A. Riser, resigned.

Dr. Leldon W. Martin, Greenwood, County Health Officer, resigned and will engage in general practice at Avon Park, Fla.

Deaths

Dr. Boyce O. Sally, Norway, aged 68, died February 14, following a long illness.

(Continued on page 46)

STOVARSOL

(REG. U. S. PATENT OFFICE)

Acetylamino-oxyphenylarsonic Acid

Indicated in Amebic Dysentery

Accepted by Council of Pharmacy and Chemistry A. M. A.

Distributed in bottles of 25 tablets, each tablet 0.25 grams

May be obtained through your druggist

Literature furnished on request

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New York PHILADELPHIA St. Louis

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The HANOVIA QUARTZ LAMPS have been constructed for practical usage. Actual clinical conditions have dictated their form. Successful treatment of actual indications attests to their therapeutic value.

The ALPINE SUN LAMP is best suited for radiating large areas, for general body dosages, etc., whereas the KROMAYER LAMP is best suited for treating local and orificial conditions.

We recommend a reading of "INTESTINAL TUBERCULOSIS, Diagnosis, and Treatment" by Brown and Sampson (Lea and Febiger), price $4.00. It can be ordered through us.

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Gentlemen:

Please send me, without any obligation, data and reprints upon the application of Quartz Light to general practice.

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Time-proved Efficacy

PYRAMIDON

For more than 30 years Pyramidon has alleviated pain. Today it is employed more extensively than ever before.

Headaches and dysmenorrhea submit readily to Pyramidon. Gratifying results are obtained also in neuralgia, articular and muscular rheumatism, neuritis, sciatica and other painful affections.

Additional information will gladly be furnished.

H. A. METZ LABORATORIES, Inc.

(Continued from page 44)

Dr. Fletcher S. Porter, Pickens, aged 56, died February 24 of uremia.

Dr. Wendell Lee Latimer, Lowndesville, aged 31, died February 19, at Montalto, Pa., of tuberculosis.

TENNESSEE

Anderson County Medical Society has elected Dr. J. Sam Taylor, Clinton, President; Dr. H. F. Stiltner, Clinton, Vice-President; Dr. J. S. Hall, Clinton, Secretary.

Bedford County Medical Society has elected Dr. M. L. Connell, Wartrace, President; Dr. V. K. Earthman, Shelbyville, Vice-President; Dr. W. H. Avery, Shelbyville, Secretary-Treasurer.

Campbell County Medical Society has elected Dr. H. L. Gallagher, Careyville, President; Dr. Thomas Jennings, Jellico, Vice-President; Dr. F. A. McClintock, Newcomb, Secretary-Treasurer.

Hamilton County Medical Society has elected Dr. S. S. Marchbanks, President; Dr. Ed Newell, Vice-President; Dr. Lyle West, Secretary, all of Chattanooga.

Henry County Medical Society has elected Dr. R. J. Perry, Springville, President; Dr. R. L. Witherington, Paris, Secretary-Treasurer.

Hickman County Medical Society has elected Dr. J. B. Webb, Goodrich, President; Dr. C. V. Stevenson, Centreville, Vice-President; Dr. W. K. Edwards, Centreville, Secretary-Treasurer.

Knox County Medical Society has elected Dr. M. H. Lee, President; Dr. Henry Clay Long, Vice- President; Dr. Jesse C. Hill Secretary-Treasurer, all of Knoxville.

Lauderdale County Medical Society has elected Dr. J. B. Lackey, President; Dr. S. M. Glenn, Vice-President; Dr. W. V. Sanford, Secretary-Treasurer. all of Ripley.

Lincoln County Medical Society has elected Dr. J. M. Shelton, Kelso, President; Dr. T. A. Patrick, Fayetteville, Vice-President; Dr. C. L. Goodrich, Fayetteville, Secretary-Treasurer.

(Continued on page 48)

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Incorporated under the laws of Illinois, not for profit, but for the purpose of making radium available to Physicians to be used in the treatment of their patients. Radium loaned to Physicians at moderate rental fees, or patients may be referred to us for treatment if preferred.

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The Whole Milk Formula

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It is uniform as to composition---low in bacteria count---safe and practical.

Its finely divided casein, precipitating in a small friable curd, and its small butterfat globule promote digestion and a high rate of assimilation. The full nutritive values of cow's milk are preserved in KLIM.

Fundamental Bases for Every Formula:

Merrell-Soule POWDERED PROTEIN MILK

Based on the original formula. Recognized as the protein milk of choice by the hundreds of pediatrists who have used it continuously for five years. Prepared in home and hospital with equal facility.

: : KLIM : : POWDERED WHOLE MILK

as cow's whole milk in your formulae!

--assures accuracy

--is easy to prepare

--always uniform and pure.

Merrell-Soule Powdered Whole Lactic Acid Milk

Correct in composition and acidity, possesses all the qualities of a hospital formula. Easy to prepare in the home. The desired friable curd is an inherent characteristic. A demonstrated clinical success.

Literature and samples sent promptly upon request.

Recognizing the importance of scientific control, all contact with the laity is predicated on the policy that KLIM and its allied products be used in infant feeding only according to a physician's formula.

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MERRELL-SOULE CO.
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An Advance Over the Soluble Sodium Salts of Purin Derivatives

Theocalcin

(Theobromine-calcium salicylate)

A Diuretic and Vascular Remedy

TABLETS of 7½ grains each and in POWDER DOSE: 1 to 2 tablets three times a day

Literature and samples from

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25 West Broadway New York, N. Y.

(Continued from page 46)

Loudon County Medical Society has elected Dr. W. D. Padget, President; Dr. J. G. Eblen, Secretary-Treasurer, both of Lenoir City.

Williamson County Medical Society has elected Dr. J. P. Moore, College Grove, President; Dr. B. T. Nolen, Franklin, Vice-President; Dr. K. S. Howlett, Franklin, Secretary-Treasurer.

Plans are being made for the erection of a $100,000, forty-eight bed hospital at Murfreesboro. The fund was secured from the Commonwealth Fund of New York. Arrangements have been made to have the city and county support and maintain the hospital for a period of five years.

Drs. S. W. Coley, F. W. Fielder and M. W. Searight, Memphis, have purchased a residence at 1093 Madison Avenue, which they will remodel and occupy as a clinic.

Meharry Medical College, Nashville, is now a Class A medical school, the only one in the southern section of the United States where negroes can obtain a medical education. The school is handicapped by a lack of funds. An appeal for contributions to an endowment fund will be made to its alumni and to the negro race next October, when the College celebrates its fiftieth anniversary. Dr. John J. Mullowney, President of the College, believes that many members of the medical profession will be willing to help this institution. Checks may be forwarded to the Treasurer of the College, Mr. George W. Claridge, Nashville, Tenn.

Dr. A. F. Richards, Sparta, has accepted a position in the Federal Department of Health of the State and has moved to Nashville.

George D. Sheats, Superintendent of the Baptist Memorial Hospital, Memphis, for the past two years, has been re-elected for another twelve months.

Dr. Dewey H. Peters and Miss Mary Elizabeth Crowell, both of Knoxville, were married recently.

Deaths

Dr. James F. Roper, Union City, aged 62, died January 29.

Dr. James H. Milam, Dyersburg, aged 70, died in February of pneumonia.

(Continued on page 50)

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Remember these S. M. A. advantages:

1. It resembles breast milk both chemically and physically.
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Catalogues on Request

NEW ORLEANS

(Continued from page 48)

Dr. John W. Whitehead, Bomer, died January 25.

Dr. Thomas Edward Abernathy, Chattanooga, aged 58, died February 13, of pneumonia.

TEXAS

Brazos-Robertson Counties Medical Society has elected Dr. John A. Crockett, Bryan, President; Dr. John W. Black, Bryan, Secretary.

Milam County Medical Society has elected Dr. W. B. Newton, President; Dr. D. E. Monroe, Vice-President; Dr. G. B. Taylor, Secretary.

Nueces County Medical Society has elected Dr. A. H. Speer, Corpus Christi, President; Dr. George Wyche, Robstown, Vice-President; Dr. M. J. Perkins, Secretary-Treasurer.

Palo Pinto County Medical Society has elected Dr. E. A. Rowley, Strawn, President; Dr. B. R. Beeler, Mineral Wells, Vice-President; Dr. J. F. Garmany, Mineral Wells, Secretary.

Polk County Medical Society has elected Dr. Ivison Grimes, Corrigan, President; Dr. Harry Bergman, Livingston, Vice-President; Dr. William W. Flowers, Livingston, Secretary-Treasurer.

Runnels County Medical Society has elected Dr. J. W. Blasdell, Ballinger, President; Dr. J. W. McCune, Ballinger, Secretary-Treasurer.

Victoria-Calhoun Counties Medical Society has elected Dr. F. B. Shields, President; Dr. J. V. Hopkins, Vice-President; Dr. J. H. Lander, Secretary.

Seventh District Medical Society met at Austin, February 18. The following officers were elected. Dr. Hugh S. McKeown, Austin, President; Dr. W. H. Pettus, Georgetown, re-elected Vice-President; Dr. J. J. Brady, Austin, Secretary.

A contract has been let for the construction of another Medical Arts Building in Dallas. It will be

(Continued on page 52)

CLASSIFIED ADVERTISEMENTS

WANTED INTERNES—The Gordon Keller Hospital offers appointments for internships. This hospital is a Class A Hospital of 150 beds capacity. The services are rotating and afford an abundance of clinical material. Living conditions are pleasant and there is a reasonable remuneration and maintenance. Make application to the Superintendent, Gordon Keller Hospital, Tampa, Fla.

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(Continued from page 50)

similar in construction to the present building and will be eleven stories high. The building will cost approximately $1,000,000.

Dr. William Keiller, Dean of the Medical Department of the University of Texas at Galveston, has resigned because of ill health and has been succeeded by Dr. Henry Hartman, Professor of Pathology. Dr. Keiller has been associated with the University as Professor of Anatomy since 1891.

Deaths

Dr. J. R. Echols, Lubbock, died February 8.

Dr. Wyclif Kerr Curtis, Midland, aged 73, died February 27 at a hospital in El Paso, of pneumonia.

Dr. Monroe Anderson, Dallas, aged 79, died January 25.

Dr. John Percival Hewson, Orange, aged 38, died February 27, at St. Josephs' Hospital, Denver, of pulmonary tuberculosis.

VIRGINIA

The American College of Surgeons, Maryland, Virginia, West Virginia and District of Columbia Section, held its annual meeting in Cumberland, Md., recently. The State Executive Committee for Virginia for the coming year is as follows: Dr. Wilson E. Driver, Norfolk, Chairman; Dr. S. S. Gale, Roanoke, Secretary; Dr. Frank Johns, Richmond, Counselor.

The Virginia Tuberculosis Association met in Richmond February 5. New Members elected to the Board of Directors are Drs. Dean B. Cole, Richmond, and J. B. Nicholls, Catawba Sanatorium. Captain W. W. Baker was elected Honorary President; Dr. C. R. Grandy, Norfolk, President; Dr. Roy K. Flannagan, Richmond, Secretary.

Albemarle County Medical Society has elected Dr. T. H. Daniel, Charlottesville, President; Dr. W. H. Bray, University, Vice-President; Dr. F. C. McCue, Charlottesville, re-elected Secretary-Treasurer.

Elizabeth City County Medical Society was reorgan-

(Continued on page 54)

Allen H. Bunce, A.B., M.D., F.A.C.P. George F. Klugh, B.S., M.D. Raiford T. Warnock, M.D. Jackson W. Landham, M.D.

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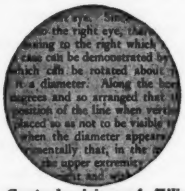
Central vision of toric lens



Central vision of Tillyer lens

Perfect Vision Through Every Part of Wellsworth Tillyer Lenses

First the flat—then the toric—and now the Tillyer,—these names sketch the evolution of lens making. Note how the clear-vision portion has grown with each development until finally, with the Tillyer, it comprises the entire lens surface. Tillyer is the only lens corrected, both for power and astigmatism.

Once the refractionist realizes the value of Wellsworth Tillyer lenses, he will prescribe nothing else. From edge to edge, they follow his Rx exactly. Accommodation required with them is the same as that of the normal eye. No unusual strain is imposed by differences in correction from center to margin. And Wellsworth is offering this ultimate achievement in lens making at a price but slightly above that for ordinary lenses!

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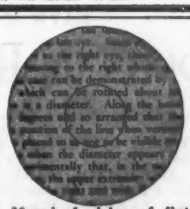
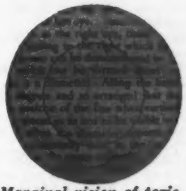
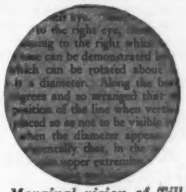


Marginal vision of flat lens is blurred



Marginal vision of toric lens is blurred



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(Continued from page 52)

ized in January. The following officers were elected: Dr. J. Wilton Hope, Hampton, President; Dr. Geo. W. McAllister, Hampton, Secretary. Meetings will be held on the first and third Mondays.

Giles County Medical Society has reorganized. The Society has been inactive since 1918. Meetings will be held on the last Monday in each month. Dr. J. W. Miller, Pembroke, was elected President; Dr. W. D. Woolwine, Pearisburg, Vice-President; Dr. W. C. Caudill, Pearisburg, Secretary-Treasurer.

Lynchburg and Campbell County Medical Society has elected Dr. W. S. Ferguson, President; Dr. A. W. Terrell, Vice-President; Dr. F. Musgrave Howell, re-elected Secretary-Treasurer. All are of Lynchburg.

Wise County Medical Society has elected Dr. W. B. Barham, Big Stone Gap, President; Dr. C. B. Bowyer, Stonega, re-elected Secretary-Treasurer.

The Elizabeth Buxton Hospital, Newport News, celebrated its twentieth anniversary on February 23, at which time the hospital staff presented a memorial tablet to the late Dr. E. M. Newsom.

New members of the Health and Sanitation Committee of the Richmond Chamber of Commerce are Drs. H. W. Glanton, W. T. Graham and Charles H. Phillips.

Dr. James Morrison, Lynchburg, has been elected President of the Boy Scout Council of that city.

Dr. Bernard H. Kyle, Lynchburg, held a clinic recently at the Chesapeake and Ohio Hospital at Clifton Forge, for crippled children.

Dr. William F. Drewry, City Manager of Petersburg, has been reappointed to the Governor's Advisory Board on Mental Hygiene.

Dr. E. P. White, Odd, has been elected President of the First National Bank, Poquoson.

Dr. J. Henry Rawlings and Dr. James R. Gorman have been elected Directors for the Lynchburg Boat Club.

Dr. Garnett Nelson has been re-elected President of the Richmond Tuberculosis Association.

Dr. Hunter McClung was recently elected President of the Golf Club of Lexington.

Miss Alberta V. Terrell has been appointed Super-

(Continued on page 56)

Immediate Stimulation in Cardio-Respiratory Failure

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Acts almost instantly intravenously and in 5 to 10 minutes intramuscularly

Indications: Cardiac Affections, Influenza, Pneumonia, Typhoid, Cholera Morbus and Infantum, Surgical Shock, Dyspnea of Asthma, Chronic Bronchitis, and Tuberculosis.

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Pamphlet on Application

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(Continued from page 54)

intendent of the Lynchburg Hospital, to succeed Miss Florence Wells, resigned.

Deaths

Dr. Lawrence Ingram, Richmond, aged 61, died February 19.

Dr. Philip Turner Southall, Amelia, aged 75, died February 16.

Dr. William R. Siron, McDowell, aged 61, died February 17.

Dr. George Earl McCorkle, Keysville, aged 61, died February 21, after a short illness.

WEST VIRGINIA

At the annual meeting of the West Virginia Newspaper Publishers Association held in Wheeling, February 12, the organization voted unanimously to support the West Virginia State Medical Association in its campaign to educate the public in matters of health. Mr. Sterrett O. Neale, Executive Secretary of the State Association, among others, addressed the meeting.

At the recent meeting of the Tri-State Medical Association of West Virginia, Ohio and Kentucky, Dr. Thomas W. Moore, Huntington, was elected President; Dr. F. O. Marple, Huntington, Secretary-Treasurer.

The Barbour-Randolph-Tucker Medical Society has authorized the secretary to provide the four members of the legislature and three members of the State Senate with subscriptions to Hygeia.

Deaths

Dr. Robert Gertsell, Keyser, aged 76, died in February.

Dr. John Bowen Smith, Clarksburg, aged 78, died December 12.

Dr. George W. Swimley, Bunker Hill, aged 88, died February 1 of senility.

Dr. Charles Summerfield, Hoffman, Keyser, aged 71, died February 18 of chronic endocarditis.

Dr. James W. McCoy, West Liberty, aged 87, died February 14 as a result of a cerebral hemorrhage, which occurred three years ago.

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"ACID added to cow's milk decreases the buffer action of the milk. Acid milk increases gastric activity, thereby bringing gastric activity within the range of peptic digestion." (2)

Marriott and Davidson (3) observed that poorly nourished infants showed a definite acid deficiency in the gastric juice. They employed Lactic Acid Milk in the treatment of malnutrition. At the St. Luke's Children's Hospital, Marriott was able to reduce the mortality from athrepsia from 78 percent to 26 percent.

Gleich (4) used Lactic Acid Milk with success as a complemental food with breast milk. Weight gains were satisfactory.

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The use of LACTIC ACID MILK appeals to the infant feeder from a biologic as well as a chemical standpoint and is fast becoming popular with pediatrists throughout the land.

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Each package contains enough powder to make four quarts. One level tablespoonful of DEXTRI-MALTOSE added to 8 ounces of reliquefied Lactic Acid Milk will bring the carbohydrate content up to 7 percent.

MEAD'S LACTIC ACID MILK

may be made up and ready to feed in five minutes. It flows readily through the feeding nipple.

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